INFORMALITY AND DEVELOPMENT

by

KARL MAGNUS ELLINGGARD

THESIS

presented for the degree of

MASTER OF ECONOMIC THEORY AND ECONOMETRICS

Department of Economics, University of Oslo

January 2007

Økonomisk institutt, Universitetet i Oslo

Contents

List of Figures

List of Tables

Acknowledgments

I want to thank my supervisor Marte Strøm for her much appreciated comments and generous support. I would also like to thank Jo Thori Lind for his help.

My family and friends that has supported me through these years at UiO deserve my deepest gratitude. Most of all, I want to thank Jonas and Miriam for their support and patience; this work is dedicated to you.

University of Oslo, January 2007

Kalle Ellinggard

Chapter 1

Introduction

Informality, often referred to as the informal sector, is crudely defined as all unregistered economic activity. To be a bit more specific it may be defined as the value-added from all unobserved economic activity that is not included in the calculation of the gross domestic product (GDP). This definition captures the production of households, self-employed and unregistered small-scale enterprises that create value added to the economy. In developing countries this phenomenon makes up a large part of the overall economy; by some estimates it accounts for 30 to 60 percent of the official GDP[1], while as much as over 70-80 percent of the labour force is characterized as informal in the most extreme cases. There is no evidence that this phenomenon is on the retreat; most experts seem to believe that the numbers have increased recently (see figures 1.1 and 1.2).

Considering that informality is such a large part of economic life, especially in developing countries, we are curious to find out if it has any effect on the economic development of nations. Since the most commonly used measure of economic development is the growth rate of national income, we analyze the relationship between the magnitude of the informal sector and GDP growth. We use estimates of the size of the informal sector that is provided by Schneider (2005). These estimates are made using a structural equation model called the dynamic multiple

[1]These are estimates of the *shadow economy*. See section 3.3.1.

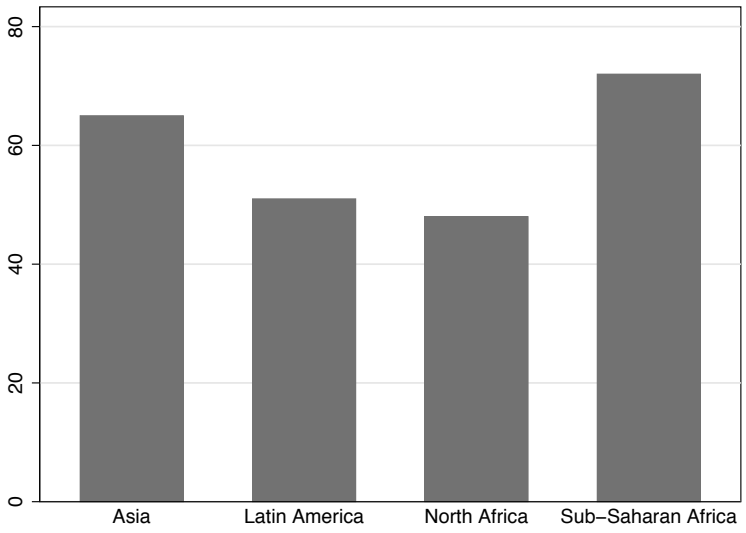

Figure 1.1: Non-agricultural informal employment.
Observations in percent of non-agricultural employment. Source: ILO (2002).

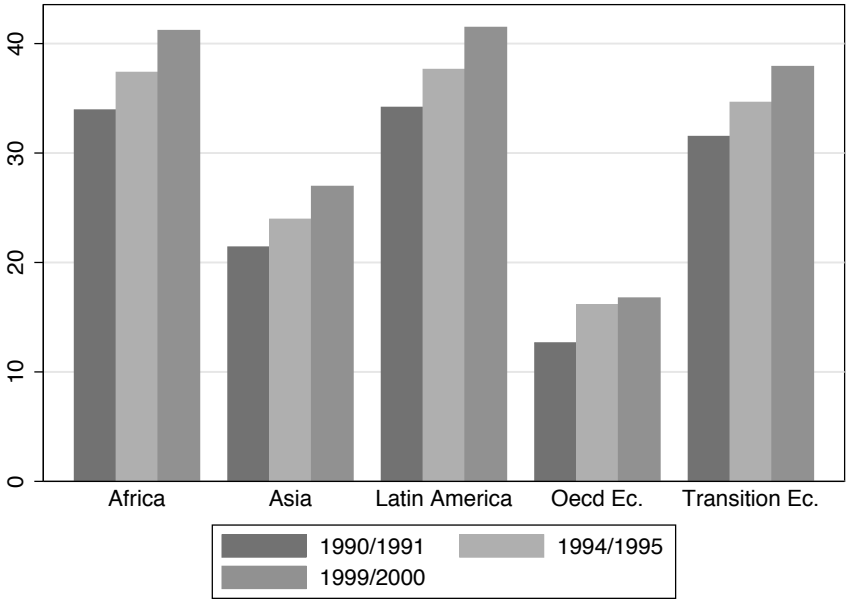

Figure 1.2: Size of the informal sector in the 1990's.
In percent of official GDP. Source: Schneider (2005).

indicators multiple causes (DYMIMIC) model, and they are expressed as the size of the informal sector as a share of GDP.

The analysis is based on entering the estimated relative size of the informal sector into an empirical growth model, where the real GDP per capita growth rate is the dependent variable. We then run random and fixed effects regressions on growth for 109 countries from all regions of the world over three periods in the last decade, in 1990-91, 1994-95 and 1999-2000. All data transformations and regressions are performed using Stata Intercooled 9.0.

We find that the size of the informal sector has a negative effect on GDP growth in developing countries. Increasing the size of the informal sector with one percentage point to GDP leads to 0.42 percentage points decline in GDP growth. The results for developed economies and economies in transition from a formerly planned economy are less clear, indicating a small positive effect of increasing the informal sector. The latter result is not significant at conventional levels of confidence.

Before we take on the empirical analysis we will discuss important features of informality. First we will address the question of what informality actually is. Informality is associated with many economic activities and the issue of how to define informality is still unresolved. Thus we will discuss some different approaches that have been made to define informality.

A central part of this treatment discusses the causes and consequences of informality. An important aspect is the effect of an increasing informal sector. We also discuss different hypotheses on the effects of informality on growth.

Another important issue for most economists in this field of research is the pursuit of a method to measure the "size" of the hidden and unobserved informal sector. We will discuss several different methods that has been developed to measure informality, with emphasis on the multiple indicators multiple causes (MIMIC) model that is the most modern approach to measure the relative size of the informal sector.

The outline of this thesis is as follows: Chapter 2 provides a background discussion of different aspects of informality and the history of the concept informal sector. In chapter 3 we discuss various definitions of informality and try to clarify what informality really is. In particular, we shall describe how the informal sector is defined since this will provide the underlying assumptions for our framework of analysis in the subsequent empirical treatment. In chapter 4 we will discuss the causes and consequences of informality, the effects of increasing informality and the relationship between the informality and development. Chapter 5 gives a survey of methods that may be used to estimate the size of the informal sector. In chapter 6 we consider some important empirical studies, in particular the study made by Schneider (2005) will provide a backdrop for our own empirical study made in chapter 7.

Chapter 2

Background

2.1 Types of informality

Palmade & Anayiotos (2005) takes on a generally negative view of informality and describes four main types: Labour informality, product informality and land informality and tax evasion.

Regarding the *labour informality*, few social rights, no social security, minimum wage and little vocational training leaves the informal enterprises (and the overall economy) in an informality trap of low productivity. This is actually ensured by labour regulations intended to protect workers that makes it cumbersome for firms to hire workers formally. *Product informality* is characterized by stringent product market regulations such as quality standards which leads firms to produce informal goods. This gives the informal firms a competitive advantage such that more productive firms are squeezed out. Poor enforcement of intellectual property rights and trade barriers are other sources of product informality. *Land informality* are caused by cumbersome government registration processes, government ownership of land and low property taxes. Subsidies of utility (livestock) prices make it even more difficult to develop land. This means high social costs in terms of extended urban slums (the lack of formally developed land accounts for nearly half of the

population living in slums in the developing world), and economic costs in terms of no mortgage-backed financing for firms operating on informal land. Just as in the case of product informality *tax evasion* creates competitive advantages for informal enterprises as opposed to formal (and more productive) companies. Since informality takes away the advantage of formal productivity, more firms become informal and the government has to increase the tax rate due to the reduced tax base. This increases the incentives for firms to go informal even more, thus creating a vicious cycle.

There are several other types of informality; for instance, the informal water supply is the only source of water for many of the poor people in the least developed parts of the world. Informal housing is another important activity that provides services that governments in developing regions are unable to provide due to the increasing urban migration. In a discussion of the contribution of the informal sector Lubell (1991) states that "[t]he economic contribution of informal sector housing is enormous, its contribution to human welfare incalculable." Hence, it is important to emphasize that informality contributes positively as well. For many workers and enterprises, the informal sector allows for greater flexibility and mobility than the formal sector and it is more able to absorb excess supply of labour. In developing countries it is also known for providing subsistence, a feature of informality that is sometimes forgotten when people discuss the effects of informality. It may thus be argued that informality also contributes positively to development.

There are many kinds of different activities that are associated with informality and to the informal sector. Djankov et al. (2002) provides a useful categorization of such informal activities based on the degree of informality in the enterprises that operate in the formal and informal sector (see table 2.1). Notice the implicit assumption that all enterprises place themselves somewhere on the "spectrum of business activity, ranging from informal to formal"; this conveys the notion that it is difficult, if not impossible to categorize the economy into two separate entities, the formal and informal sector.

	Informal sector		Formal sector	
	Subsistence enterprises	Unofficial enterprises	Unofficial enterprises	Official enterprises
Degree of informality	100%	High proportion of sales workers not registered	Some proportion of sales undeclared and workers unregistered	
Type of activity	Single street traders, cottage/micro enterprises, subsistence farmers	Small manufacturers, service providers, distributors, contractors	Small and medium manufacturers, service providers, software firms	
Technology	Labour intensive	Mostly labour intensive	Knowledge and capital intensive	
Owner profile	Poor, low education, low level of skills	Poor and non-poor, well educated, high level of skills	Non-poor, highly educated, sophisticated level of skills	
Markets	Low barriers to entry, highly competitive, high product homogeneity	Low barriers to entry, highly competitive, some product differentiation	Significant barriers to entry, established market/product niche	
Finance needs	Working capital	Working capital, some investment capital, supplier credit	Investment capital, and working capital, letters of credit, supplier credit	
Other needs	Personal insurance, social protection	Personal and perhaps business insurance	Personal and business insurance, business development services	

Source: Djankov et al. (2002).

Figure 2.1: Types of informality.

2.2 History of the concept informal sector

One of the first to discuss the dual economy of developing countries was Boeke (1953) who divided the economy into what he called the "firm-centred economy" and the "bazaar-economy". The former was characterized by an efficient conduct of business, high productivity and capital and technology intensive production, the latter was known for its low productivity, its labour intensity, small scale, low income and a high capacity for absorption (Renooy 1990). This was followed by several studies emphasizing the dual distinction between the formal economy and the "traditional economy". The notion of the "informal sector" was first used by Hart (1973)[1] that studied the structure of employment in Accra, Ghana. This was used to label some part of the urban labour force that operated outside the formal labour market, and was almost synonymous to any group that could be said to consist of self-employed individuals, including criminal activities.

The research on the informal sector is considered to be pioneered by the Kenya employment mission[2] that was conducted by the International Labour Office in 1972. This study came much in response to former ideas on informality that stated that it would disappear by itself as the less developed parts of the world caught up with the developed regions. The Kenya employment mission recognized that the traditional sector had, in fact, "not just persisted but expanded to include profitable and efficient enterprises as well as marginal activities" (ILO 2002). Thus, they used the term "informal sector" (from Hart (1973)) to distinguish it from the obsolete notion of a "traditional" sector. In ILO (1972) the informal sector was characterized by enterprises' avoidance of government regulations and taxes, and it was thought to provide subsistence to the poor. To mediate the negative consequences of the informal sector one should therefore address issues of poverty and employment relations. One important difference between the two studies of Hart and ILO was that Hart (1973) focused on self-employed individuals, while

[1] Keith Hart introduced this concept first in 1971 at a conference on urban unemployment in Africa.

[2] This was one of the first in a series of "employment missions" initiated by ILO.

ILO (1972) focused on the behaviour of small-scale enterprises. The latter became the focus of study in much of the later literature on the informal sector.

The focus on informality changed somewhat after the famous study by de Soto (1989). This study emphasized the role of political institutions and legal structures in the development of the informal sector; investigating how excessive regulations, red tape and corruption (bribes) create barriers to entry into the formal sector, thus forcing workers and enterprises into the informal sector. Entering the informal sector was not only a response to the opportunities that the informal sector creates, but also a response to the barriers that hinder the entry into the formal sector.

Along the way the literature on informality has been mixed with studies of more specific phenomena, such as tax evasion and illicit work, broadening the concept and in some cases pushing the development towards a more macro-based approach to the study of informality. This has led to the development of macroeconomic measurements of the size of the informal sector in terms of both the income created and working hours supplied to the informal sector, making it possible for economists to analyze the macroeconomic causes and consequences of the informal sector and informal activities.

Chapter 3

Defining informality

What is informality? Throughout the economic literature there exists no commonly accepted definition of this phenomenon. Furthermore, there is no consensus on how to label this phenomenon. The labels includes the underground, subterranean, shadow, informal, irregular, hidden, parallel, clandestine, black, second and household (economy or sector), thus contributing to the confusion regarding the definition of informality. These labels do in some cases refer to quite different domains of informality and the application of these labels differs also from study to study. It is therefore difficult to compare the literature on informality and its different methods and empirical findings since it often depends on the problem at hand.

There have been several different approaches to defining informality. One of them is the approach taken by those who first studied the informal sector in developing countries. They mostly defined the informal sector as consisting of all small enterprises. Other approaches are based on simpler phenomena (in terms of defining it) such as tax evasion and/or tax avoidance. Economists were studying the magnitude of unreported income already in the 1950's.[1] However, this type of informality is only a part of what may be defined as the underground or informal economy. The broad definitions of informality consist of many different economic

[1] See Cagan (1958).

activities and economic units.

The informal sector, most commonly studied in the context of developing countries, could most easily be defined by what it is not, i.e. the formal sector. But this is considered to be too simplistic, the formal and informal sector are not independent entities, they are deeply intertwined and interdependent. This naturally creates much difficulty and confusion when trying to define the informal sector. By searching for common properties of the informal sector one will often include one too many when making such lists of properties. This is because the informal sector consist of many phenomena, some of them working together, some not, and this creates the utter confusion when discussing the informal sector: It is not one single entity, not a specific group of individuals or enterprises and certainly not some specific number.

In the following sections we shall focus on the economic criteria for defining informality. What these criteria are about should become clear as we discuss some of the different approaches that have been made to define informality. Most importantly, we shall discuss the definition of the *shadow economy* that is used by Schneider (2005). This definition is part of the framework for our empirical investigation of informality and development.

3.1 Criteria used to define the informal sector

In a review of the literature on the informal sector in developing and developed countries, Gërxhani (2004) gives an account of the different criteria that has been used to define or classify the "informal sector" in some of the most important studies on the informal sector. These classifications are divided into three main institutional criteria: Political, economic and social criteria. The political sub-criteria refer to (1) government regulation, (2) illegal activities and (3) national statistics. These are used to explain the impact of informality on politics, where especially the extent of governmental regulation has been used to define the informal sector. The economic sub-criteria are (1) the labour market or status of

labour, (2) unreported income or tax evasion, (3) size of activity or scale of operation, (4) professional status, (5) regulation or registration of activities and (6) national statistics or GNP accounts. Here the first two criteria as well as the last two are probably the most applied ones in the most recent literature. The size of activity/scale of operation criteria has been employed to a larger extent in studies of developing countries. The social criteria are (1) social networks and ease of entry, (2) autonomy and flexibility and (3) survival. The second criterion is probably more important in developed countries, while the survival criterion is considered relevant to the less developed countries only.

3.2 Informal employment and the informal economy

In an attempt to create a benchmark statistical definition of the informal sector to reinforce the pursuit of statistics on informality, the International Conference of Labour Statisticians ICLS adopted the following definition of the informal sector (see figure 3.1).[2]

This definition was also later adopted in the revised International System of National Accounts (1993 SNA). To comply with SNA standards, the definition was based on production units instead of employment relations (ILO 2002). To take the employment relations into account when speaking of informality and to improve the old terminology, ILO (2002) therefore introduces[3] the expanded concept of the "informal economy"[4] to "...incorporate in[to] this concept [i.e. the informal sector] the whole of informality - including both enterprise and employment

[2]This figure is found (unaltered) in ILO (2002).

[3]The label "informal economy" was by no means new in the literature on informality, but the attempt to define it as an expanded concept of the informal sector is quite recent.

[4]Thomas (1992) argues that using the term *economy* is misleading since it presupposes that it exists at a unique location (such as in a country), i.e. there cannot exist several economies at the same place.

[. . .]The informal sector is regarded as a group of household enterprises or unincorporated enterprises owned by households that includes:

- informal own-account enterprises, which may employ contributing family workers and employees on an occasional basis; and
- enterprises of informal employers, which employ one or more employees on a continuous basis.

The enterprise of informal employers must fulfill one or both of the following criteria: size of unit below a specified level of employment, and non-registration of the enterprise or its employees. [. . .][F]lexibility is allowed with respect to the upper limit on the size of employment; the introduction of additional criteria such as non-registration of either the enterprise or its employees; the inclusion or exclusion of professionals or domestic employees; and the inclusion or exclusion of agriculture.

Figure 3.1: ICLS definition of the informal sector.

relations - as manifested in industrialized, transition and developing economies."[5] In this concept they discuss in specific what the informal economy *is not*, i.e. the formal economy (in this setting the formal economy means "regular, stable and protected employment and [. . .] legally regulated enterprises"), the criminal economy (meaning the production and distribution of illegal goods and services, the informal economy being characterized by production and distribution of legal goods and services) and the reproductive and care economy (which is unpaid domestic work and care activities; these activities does not entail any form of transactions), and what the informal economy *is*, i.e. informal employment in and outside informal enterprises. The most pronounced difference of this way of defining informality here compared to the 1993 ICLS definition is that the informal economy now includes informal employment in formal (sector) enterprises. Previously, informality was considered to be only informal (and formal[6]) employment in informal enterprises since the informal sector was defined to be all informal enterprises. One other important aspect here is that the informal economy captures "all remunerative work

[5]The fact that ILO and others have had trouble with sticking to the 1993 ICLS definition of the informal sector goes to show how difficult it is to define informality and apply it in research.

[6]This type of informality is rare and in most cases not considered.

- both self-employed and wage work - that is not recognized, regulated or protected by existing legal or regulatory frameworks and non-remunerative work undertaken in an income-producing enterprise." This concept of informality thus contradicts earlier notions of two disjoint sectors, taking into account that most employment relations are on a continuum between the "completely" formal relations (in terms of labour market regulations and legal protection) and the "informal" end of the spectrum. This is not only based on the observations of informal employment in formal enterprises, but also the increased use of informal sub-contracting by formal enterprises and the use of part-time and temporary employment (which is informal in most parts of the world outside the developed community).

One way of classifying the different elements of the informal economy according to ILO (2002) is by the types of economic units and by employment status. There are three relevant types of economic units: Formal enterprises, informal enterprises and households. The different employment statuses are own-account workers, employers, employees, contributing family workers and members of producers' cooperatives. This categorization resembles the one depicted in table 2.1.

3.3 The income based unobserved sector/economy

A large part of the literature on informality defines it in conjunction with the measured and observed economy. The informal or unobserved economy is the part of the economy that is not captured by the measurement of e.g. the gross domestic product (GDP). In his "Unobserved income hypothesis" (UIH), Feige (1981) asserts that

> "...the UIH suggests that systematic biases, unwittingly introduced into our official data, have fundamentally distorted our perceptions of economic realities. [...] the bias introduced into our information system is closely associated with a large and growing sector of economic activity which has eluded governmental observation".

The shadow economy includes all marked-based legal production [and distribution] of goods and services that are deliberately concealed from public authorities for the following reasons:

- to avoid payment of income, value added or other taxes,
- to avoid payment of social security contributions,
- to avoid having to meet certain legal labour market standards, such as minimum wages, maximum working hours, safety standards, etc., and
- to avoid complying with certain administrative procedures, such as completing statistical questionnaires and other administrative forms.

This definition excludes the criminal sector (which is defined as the production and distribution of illegal goods and services), and the household sector (all household services and production).

Source: Schneider (2005)

Figure 3.2: Definition of the shadow economy.

Feige (1981) thus defines the unobserved sector as all economic activity that escapes the measurement of the GDP because of accounting conventions, non-reporting or underreporting. In a later application, Feige (1989) defines the underground economy as "those economic activities and the income derived from them that circumvent or otherwise elude government regulation, taxation or observation", which is considered to be a quite wide definition of the informal sector (Schneider 2005).

3.3.1 The shadow economy

Considering that we shall make use of estimates of the informal sector made by Schneider (2005), we will discuss his definition of what he calls the *shadow economy* (see figure 3.2). This definition is constructed to fit the empirical strategy in this study of the informal sector in 110 countries worldwide. We see that the definition hinges on the economic activities that are hidden from the public authorities in order to avoid taxes, regulations and other administrative costs, where the impact

of (the burden of) taxes and regulations are the most important ones in Schneider (2005). This definition of the informal sector underlies the MIMIC model that is used to estimate the size of the informal sector (see section 5.3).

Schneider (2005) does not elaborate on how the informal sector relates to the official /formal economy. To get a more comprehensive understanding of how the underground economy is categorized by the author, we look at a figure from Schneider & Enste (2002) (see figure 3.3.). This figure depicts the dual economy, a crude representation of how the overall economy is divided. The term *underground economy* is used as the opposing part to the official sector/economy, constituting the unobserved economy (in terms of not entering the estimation of the official GNP). Here the underground economy is defined as all economic activities that contribute to the national product, but are left out of the calculation of the national product for certain reasons. I.e. the definition of the informal sector is income-based. Schneider & Enste (2002) mentions three reasons why these activities are not registered: (1) they are not recorded because of customs (2) because it cannot be recorded, or partly because of the lack of appropriate methods, and (3) because the value-added of these activities are not observable. The first point is associated with the self-sufficiency economy (household production and non-market transactions), while the last is associated with the informal sector. Thus the informal sector is defined by the unobservable value-added from market-based transactions. This conforms with the definition of the shadow economy in Schneider (2005).

Consider now figure 3.4. This figure takes account of the legal dimension of informal activities. Here we notice the that Schneider & Enste (2002) uses the term *irregular sector* to describe the part of the *shadow economy* that involves the *illegal* production and distribution of *legal* output, excluding the criminal sector (illegal output).[7] This irregular sector coexists with a *informal sector* that is defined to be synonymous to the self-sufficient economy. Thus the informal sector is very narrowly defined in this context. This contradicts some of the literature on the

[7]Thomas (1992) uses this categorization to capture the different sectors of informal economic activity.

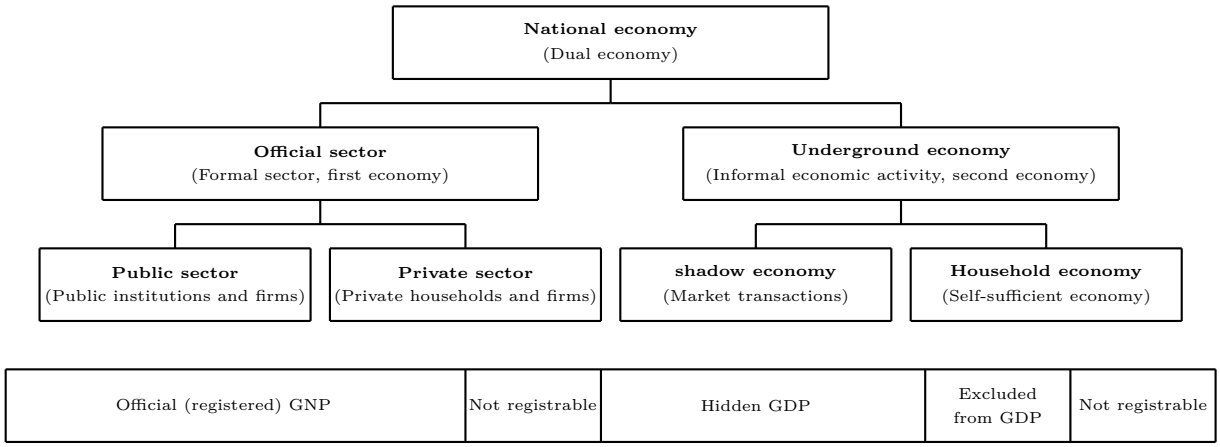

Figure 3.3: The dual economy.

informal sector/economy in developing countries, were there seldom are made a distinction between the informal or irregular sectors on the basis of whether the production and distribution are legal or not (most distinguishes on the basis of the status of the economic unit, i.e. whether the enterprise or its workers are formal or not). Schneider & Enste (2002) makes it clear that "The informal sector is predominant in developing and transforming countries where small firms produce a large share of the economic added value." Furthermore, the informal sector are rarely prosecuted, thus it may be defined in terms of governmental enforcement or supervision. It is therefore rarely connected to tax evasion. However, this distinction makes it clear what Schneider & Enste (2002) are mainly focusing on, i.e. illicit work[8]. This focus may be attributed to the fact that Schneider & Enste (2002) is focusing mainly on developed countries.

It is important to understand that the main distinguishing characteristic of the informal and irregular sectors are that the authorities want to prosecute firms and workers in the irregular sector, while those in the informal sector are left alone (see Thomas (1992) that uses a classification system that conforms to the classification system in figure 3.4). Considering that we later will use *shadow economy* estimates

[8]Often referred to as black labour in developed economies.

	Household sector	Informal sector	Irregular sector	Criminal sector
Production/ distribution	legal	legal	illegal	illegal
Market transactions	no	yes	yes	yes
Output (goods/ services)	legal	legal	legal	illegal
Examples	Do-it-yourself home office work; baby-sitting; exchange of goods	Neighbourhood help; counselling centres; self-help organizations; honorary activities; network help	**Illicit work**	Trade with stolen goods and drugs; prohibited gambling; fraud; smuggling; stolen goods

Figure 3.4: Categorization of informal economic activities.

(figure 3.2), it is difficult to establish whether the informal sector is included in the measurement of the shadow economy or only partly (granted that the definition of the shadow economy conforms with the definition of the irregular economy[9]). What we do know is that these definitions are made to describe some part of the economy that is unrecorded in the national statistics, and this applies to both the informal and irregular sectors. At the outset, this thesis is about development and informal economic activities, and we will generally not make such a distinction between an informal sector and an irregular sector.

[9]Thomas (1992) defines the irregular sector as consisting of economic activities associated with tax evasion, avoidance of economic legislation, avoidance of bureaucracy, social security fraud and illegal immigration.

Chapter 4

Causes and consequences of informality

4.1 Theories related to the informal sector

Due to the diversity of focus and approaches, there has unfortunately not been developed a general theory of the informal sector. This is partly because most researchers does not approve of the simplistic notion of a dual economy, but also because there lacks a general agreement of what the informal sector or economy is. Furthermore, the literature is fraught with anecdotal evidence that is mostly based on studies in particular regions of the world. Thus it seems like "... almost every possible explanation has been given" as Gërxhani (2004) put it. We will however discuss some different attempts that have been made to explain informal economic activities in term of their relationship with the formal economy and the motives people and enterprises have to enter the informal domain.

4.1.1 The dual economy approach

Originating from the notion of a dual economy in Boeke (1953) and others, models were developed to explain the dynamics between the rural agricultural sector and urban modern sector by Lewis (1954) and later by Harris & Todaro (1970). These models did not discuss the informal sector at the outset (they were rather discussing rural-urban migration), but has later been expanded by e.g. Fields (1975) to include assumptions such that a majority of the urban unemployed are considered to be working in the urban informal sector. It is here theorized that all workers that are in the informal sector (and those that migrate from the rural sector) are trying to get a job in the modern sector, and that the informal sector works as a fallback option for those who fail to get a modern sector job. The informal sector is considered to offer subsistence to the urban poor in this setting. One important feature of this expanded model is to explain why there may be wage differences between the informal and modern sectors and why the rural population continues to migrate to the urban sector despite the slim chances of getting a job in the small modern sector. This approach has been criticized for its simplistic dual economy assumption; that there are informal workers in the urban sector only, and that all workers in the informal sector wants to work in the modern sector (Thomas 1992).

4.1.2 Tax evasion

Tax evasion is the most studied phenomenon in the economic literature on informality. The theoretical contributions to theories of tax evasion may roughly be divided in two categories, depending on the assumptions made on the role that the government plays. The first assumes that the government is controlled by a benevolent dictator, a characteristic assumed in social welfare theories (among those are the optimal taxation theory developed by Allingham & Sandmo (1972) among others); the second assumes that government agents are rational utility maximizers, known from public choice theory.

Optimal taxation theory is about how the government chooses the optimal tax policy (in terms of tax and penalty rates) to maximize welfare by increasing the tax revenue or tax pool. Alternatively, one may define the problem to be how the government tries to minimize the total burden of taxation (Wintrobe 2001). The only reason for people to pay taxes is to avoid being caught for tax fraud by government prosecution. Increasing the tax rate will increase the tax revenue but reduce the supply of labour, as some workers will avoid the increased taxes. This theory assumes that people avoid taxes in response to tax increases, not necessarily evade them. What optimal taxation theory fails to explain is that some people may choose to supply their labour hours in the informal sector instead of in the formal economy. Another problem with this theory is that it fails to take into account the impact of the quality of public goods that the government offers, a common characteristic of public choice theory. Attempts have been made to introduce the impact of public goods by Cowell & Gordon (1988) and they find that with decreasing absolute risk aversion and under-provision of public goods, tax evasion will increase in response to improved public goods provision financed by higher tax rates. This general proposition has found little empirical support however. Most rather find that taxpayers take into account both the cost of higher taxes as well as the perceived improvement in public goods provision when deciding to evade taxes (Gërxhani 2004).

One other weakness with models of optimal taxation is that the probability of being detected seems to be very low in most cases (as is the magnitude of penalties). This suggests that there must be other factors that constrain the behaviour of the taxpayer. Mordignon (1992) includes the effect of individuals' perception of fairness regarding their choice to evade taxes. If individuals believe that many others are evading taxes, then so will they. Thus the perceived fairness of tax policies induces individuals to evade. The result of such factors is that individuals may decide to comply with government taxes although it is in their best interest to evade taxes.

Wintrobe (2001) takes on a similar approach in his public choice model of tax

evasion (assuming rational government agents). Arguing that individuals have the incentive to free-ride no matter how compliant all others are, he assumes a relation built on individuals' trust in the government to deliver the promised public goods and in all tax payers to pay taxes. If an individual does not fully trust the government to provide and fellow taxpayers to comply, her willingness to pay decreases. At the margin where the individual has zero willingness to pay, she will only pay according to the standard models of optimal taxation, i.e. maximize the expected income with respect to tax rates ad detection rates (taking account of risk aversion). Thus Wintrobe (2001) predicts that we will see higher levels of tax evasion in societies where the citizens' trust in the government and each other are low. Without trust it is difficult for the government to predict what the citizens want, and in such a situation they are likely to provide less than optimal public goods provision. This is also the case if individuals have very diverse preferences (difficult to satisfy everybody's preferences) or if the government is corrupt. In the end, it is the individuals' surplus of income and public goods that determine the level of tax evasion, and the effect of increased taxes is that the propensity to evade taxes decreases if it increases the surplus of the citizen, assuming that public goods are under-provided initially (otherwise surplus would decrease).

4.2 Causes of informality

There are both economic and non-economic reasons for participation in the informal sector. The economic motives relate to unemployment, an inflexible formal labour market and cost advantages in the informal production in terms of e.g. lower real capital prices. Greater flexibility and satisfaction on work, more leisure time and the benefit of utilizing more of ones qualifications are examples of non-economic motives to move to the informal sector (Gërxhani 2004). In a behavioural economics perspective, Renooy (1990) discusses two types of factors that are important in determining whether people choose to engage in informal activities, i.e. structural and opportunity factors. The structural factors are financial pressure,

socia-psychological factors and institutional constraints. The opportunity factors are made up from the individual skills, network and living situation; as well as the environment,social norms and tradition, values and standards. According to Renooy (1990) the opportunity factors explain why there exists informal economic activity. In this context the attitudes towards the government are particularly important, and together with the information set that individuals base their decisions on, people will decide on how they will comply with governmental taxes and regulations. In cases where the government has low credibility, the barriers to entering the informal sector is lowered to a large extent.

The increased (actual and perceived) burden of taxes and social security contributions are considered to be some of the most important causes of the development of the informal sector. Increasing direct and indirect taxes affect labour-leisure choices and the choice to take the plunge into the informal sector. The higher the difference between post-tax earnings and total labour cost in the formal labour market, the higher will the incentive become to evade the formal sector and earn a tax-free living in the informal sector. This difference depends largely on the tax and social security system and is a key feature of the existence and prevalence of the informal sector (Schneider 2005). An important aspect is the complexity of the tax system. The more complex the tax system is, the higher is the actual and perceived burden of the taxes. Furthermore, this makes it more difficult to determine the ones who are the winners and losers in the government redistribution scheme, making it more likely that most individuals feel that they are left out of the loop, creating an environment of distrust in the government. This may contribute to the individual's choice to enter into informal activities (Schneider & Enste 2002)[1]. This effect is related to the tax moral of the citizens and their inherent propensity to evade taxes and work illicitly, which also is seen as an important determinant to the development of the informal sector.

Another common determinant to the informal sector is the so-called intensity of regulations, often measured by the number of laws and regulations that exists in

[1]See section 4.3.2.

the formal sector. Excessive permit licensing, administrative procedures, red tape and bribes makes it difficult to establish an enterprise, and many are forced to work in or start up a small firm in the informal sector due to large entry costs. There may also be costly labour market regulations that make it more attractive to hire informal workers (both in formal and informal enterprises). As these costs may easily be transferred to the workers, additional incentives are created to work in the informal sector (Enste 2003).

4.3 Effects of an increasing informal sector

Schneider & Enste (2002) gives a broad discussion[2] on the macroeconomic effects of an increasing informal sector. They divide the effects into four categories: Allocation effects, distribution effects, stabilization effects and fiscal effects.

4.3.1 Allocation effects

Allocation effects may improve welfare by increasing the overall production without using more input or by producing the same volumes with less input.

The negative effects of a larger informal sector is that (1) it entails pure waste of economic resources for both those who work in the informal sector that have costs entailed by staying hidden from the view of controllers and regulators, and for the authorities that have costs related to the control, supervision and persecution of informal activities; (2) there is too low capital intensity in the informal sector due to the lack of credit (because of the risk of being detected and losing all invested capital, and because of the illegality) and due to the low labour intensity in the formal sector (because of the burden of taxation, rules and regulations for formal enterprises, making capital relatively less expensive); (3) competition is distorted because of tax evasion, informal enterprises get a cost advantage while formal enterprises must pay ever increasing taxes, thus creating a disadvantage for those

[2]This discussion is partly based on empirical evidence.

enterprises that are honest and (in most cases) more productive (this may give rise to a vicious cycle of more informal activity and low productivity); (4) reduced economic growth potential due to little or no investment in human capital in the informal sector (because of the risk of losing everything if one is detected) and due to the lack of institutional protection, such as the protection of private property; and (5) less public goods provision (or lower quality) due to a lower tax yield, e.g. reducing the financing of infrastructure which may lead to reduced economic growth (see section 4.4).

The positive effects are that (1) price mechanisms may be improved (if competition in the formal sector is very distorted) and reflect relative scarcity better since there is higher price flexibility in the informal sector (no regulations)[3]; (2) the division of labour is improved (excluding self-employment and do-it-yourself activities), leading to a rise in welfare due to comparative and absolute cost advantages; (3) competition is intensified (which is particularly beneficial when formal enterprises are artificially protected by the government), although these benefits are hampered by the distortions already mentioned, such that the overall effect is ambiguous; (4) scarce resources are used; (5) there may be additional potential for innovation in the informal sector, because it consists of more risk-loving entrepreneurs (staying in the informal sector implies that they must endure much more risk that those in the formal sector, i.e. there are few possibilities of insurance); (6) the informal sector creates income and demand, and employs unused factors (mostly labour) thus improving the economy's mode of production and reducing "real" unemployment and underemployment ; and (7) they add to the supply of goods and services.

Although the overall allocation effects of an increased informal sector is somewhat ambiguous, Schneider & Enste (2002) concludes that

> "[...] a net gain in productivity and employment can be expected, owing to the stimulation of competition. [...] Making the whole system

[3]Schneider & Enste (2002) states that this may be an important point in developing countries where the economies "are burdened by over-regulation and administration, [...] which holds back economic growth considerably.

> more dynamic leads to an increase in international competitiveness in the medium term and to a stimulation of the official economy."

But since the informal economy employs too little capital, it may be that if illicit work gains momentum, the economy's production potential decline as the volumes of capital and material assets decline:

> "Hence, growth is hampered in the long run, which weakens the positive effects gained from the stimulation of competition. The low intensity of research and technology in the shadow economy has roughly the same effect. The potential for innovation, especially in the high technology sector, is lost if the capital supply decreases."

However, taking account of the positive effects of utilizing unused factors, improved division of labour etc., Schneider & Enste (2002) believes that the overall effect is positive.[4]

4.3.2 Distribution effects

Regarding the issue of equality of distribution, the informal activities such as tax evasion and illicit work is considered to be a threat to the tax system and ultimately to the financial basis of the state. This is because individuals engaged in e.g. illicit work are free riders that may use public goods and infrastructure without paying taxes. This will reduce the tax yield, and reduce public investment and public goods provision, which will hurt the middle and lower income classes the most.

The situation will most likely become even worse if the government decides to reduce the social budget in order to reduce the tax deficit. This will in particular hurt those households who are unable to profit from additional income made in the informal sector, thereby punishing those who are moral and risk averse since

[4]It should again be noted that this discussion has a primary focus on informality in developed countries.

they will receive relatively less in transfer payments.

4.3.3 Stabilization effects

One thing that many economists in this area of research is emphasizing is that the informal sector distorts the economic indicators of the official statistics. This may lead to wrong policy decisions, possibly exaggerating the business cycles and destabilizing the economy. Examples of such distortions are (1) miscalculation of GNP; (2) of economic growth rates (the informal sector may grow at a different pace that the formal sector); (3) inflation rates are systematically too high (assuming prices grow more slowly in the informal sector); and (4) unemployment rates are too high (assuming that individuals working in the informal sector does register themselves as unemployed). This leads to the over- and understatement of several economic phenomena, such as the alleged overstatement of the unemployment rates after the oil crisis in the seventies.

The impact of informal activities on policy-making constitutes an indirect effect. But there are also more direct effects of an increasing informal sector: At one hand there are negative consequences for the formal labour market in terms of distorted competition[5], but there may also be possible short and medium term positive effects, considering how the informal sector may act as a stabilizing buffer to the formal sector, absorbing formal unemployment and excess demand in times of recession. Furthermore, the informal sector promotes flexibility of prices and wages, making the economy absorb exogenous shocks better. Thus the informal sector may counteract the general business cycle (especially if there is profound government failure) and increase macroeconomic stability. In the long run however, the negative effects on fiscal policy and society will be too important too neglect.

[5]See section 4.3.1.

4.3.4 Fiscal effects

An expansion of the informal sector leads to a reduction in the tax yield. The main problem related to less tax yield is that the government is unable to provide the same level of public benefits without increasing the rate of taxes. This sparks a downward spiral of increasing informal activity and taxes and decreasing tax base and social security contributions. But it is believed that most of the extra income that is created is spent in the formal economy, thus a large part of the lost yield "flows back into the official sector in the form of consumption" (Schneider & Enste 2002). But how much of the yield that comes back into the official sector remains controversial as is the overall impact on demand of goods and services in the formal and informal sector.

4.4 Informality and (GDP) growth

As with most aspects of informality there is little consensus regarding the impact of informal activities on development and GDP growth.[6] We shall discuss some different approaches to this subject.

In one application, Adam & Ginsburgh (1985) presents a macroeconomic model that takes account of both the formal and informal sectors, with emphasis on the labour market differences in the two sectors (excess labour supply, tax evasion and wage flexibility in the informal sector). Although the authors does not focus on the direct impact of a increase of the size of the informal economy, they make a few important inferences regarding the impact of fiscal policy on the formal and informal sectors:

- The informal sector is always stimulated by fiscal policies, but not necessarily as much as the formal sector.

[6] In lack of better alternatives, most economists use GDP growth as an indicator of development.

- The impact on the formal sector of an increase in final demand is reduced in presence of the informal economy

Hence, Adam & Ginsburgh (1985) finds that an increase in the size of the informal sector is associated with an increase in the size of the formal one, at least in the case of fiscal policy.

A different view is taken by Loaysa (1996) that presents a theoretical model of endogenous growth that links the informal sector with public goods provision and the GDP growth rate. In this model it is assumed that production in the formal sector depends on tax-finaced public goods (that is subject to congestion). Since the informal sector does not pay taxes but penalties (that is assumed not to contribute to the public goods provision), an increase in the size of the informal sector will reduce the tax base and thus reduce the GDP per capita growth rate since the public goods provision is lowered. In particular, this is thought to occur in economies where governments employ "excessive" taxes combined with the inability to enforce compliance to the tax scheme. The model therefore predicts that there will be a negative relationship between the size of the informal sector and GDP per capita growth. This result is not wholeheartedly accepted by Asea (1996) that criticize the treatment in Loaysa (1996) on the grounds that "neither the model nor the empirical analysis can speak directly to the question of what leads to the rise of the informal sector." Especially the empirical analysis of Loaysa (1996) fails to establish causality relations between the informal and formal sectors. On the theoretical level, Asea (1996) suggests that a theoretical model should incorporate the decision making process of both entrepreneurs (to participate in the informal sector) and policy-makers (to which levels of taxes and detection efforts one should apply), in addition to taking account of the fact that entrepreneurial ability is not uniformly distributed (an important determinant for the entrepreneurs decision-making and unknown to the entrepreneur initially).[7]

Considering that the effects of an increase in the size of the informal economy on GDP growth are ambiguous, Schneider (2005) suggest that there may be differences

[7]This way of modelling refers to the theoretical model of Levenson & Maloney (1998).

in impact depending on whether the economy has high or low income:

> "It may be that on the one hand in high-income countries people/entrepreneurs are overburdened by taxes and regulation so that an increasing shadow economy stimulates the official economy as additional value-added is created and the additional income earned in the shadow economy is spent in the official economy. On the other hand, in low-income countries an increasing shadow economy erodes the tax base, with the consequence of a lower provision of public infrastructure and basic public services (for example an effective juridical system), with the final consequence of lower official growth."

Thus Schneider (2005) argues that there are differences in how informality affects the formal economy in developed and developing countries, but he does not elaborate on e.g. whether there are any critical threshold levels for the informal sector that makes the negative impact of reduced tax base more pronounced than the positive value added effects.

Chapter 5

Measuring the size of the informal sector.

Schneider & Enste (2002) gives an account of the different methods that may be used to estimate the size of the informal sector.[1] These methods may be divided into direct and indirect approaches of estimation. It is important to note that these methods differ much in respect to what they intend to measure; some of them focus only on e.g. tax evasion.

The different methods to measure the informal sector may be classified by their use of either individual (microeconomic) or aggregate (macro) data. The former approach is based on direct investigation of individual behaviour, while the latter approach is based on indirect inference, utilizing economic indicators and/or determinants to estimate the magnitude of the informal economy. In this chapter we will discuss these direct and indirect approaches, with emphasis on the MIMIC approach that accounts for the measurement of the informal economy that we will employ in our empirical treatment of informality and development.

[1] Schneider & Enste (2002) uses the term shadow economy most of the time, but this term is rarely used to describe the informal sector in developing countries. Perhaps not so surprising considering that most empirical applications of these methods are focusing on developed countries.

5.1 Direct approaches

5.1.1 Surveys and samples

To gain insight into the structure and dynamics of the informal economy, microeconomic surveys and samples based on voluntary replies are superior to macro-based studies. But his method must deal with problems of under-reporting by the interviewees since they will hesitate to reveal that they are evading taxes or regulations. The results are also very sensitive to how the questionnaire is designed. Results are therefore often unreliable and unfit for estimating monetary magnitudes of informality (Schneider & Enste 2002).

The method of voluntary surveys and samples has been used by Andresen, Ognedal & Strøm (2005) to uncover the unreported wage income in Norway from 1980 to 2003. Despite the difficulties involved with voluntary surveys, they managed to establish that the magnitude of illicit work has decreased over the last decades, possibly due to improved tax morale and lower taxes. Due to the uncertainty regarding these results, they may be taken as a lower bounds on the size of the informal sector.[2]

5.1.2 Tax audits

One other direct approach to measuring the size of the informal economy is to examine the discrepancy between reported income and actual income, where actual income often is found through tax audits. Fiscal auditing programmes have been effective in revealing the extent of undeclared taxable income, and have been used to estimate the informal sector. The main problem with this method is due to a selection bias of audit cases that are meant to find cases where the probability of non-compliance is high. Hence the population investigated is not random. Furthermore, only a fraction of the non-compliant income-earners will be detected by

[2]Isacsen & Strøm (1989) states that "it is safe to assume that [the method of voluntary surveys samples] will underestimate the size of the hidden labour market."

this procedure. The resulting magnitude of the clandestine economic income will thus be downwards biased. Feinstein (1999) discusses how to overcome some of this issues with the method called detection controlled estimation. This model takes the detection process into account, estimating the undetected non-compliance. This model may be extended to ordinary enforcement data, but this data must be corrected since it is drawn non-randomly. This model has its strengths in that it focuses on the detection process (which often is ignored in discussions of detection of non-compliance), and that it gives a precise mathematical formula for estimating non-compliance. An important problem with the model is that it has problems with parameter identification, in particular when estimating average levels of non-compliance.

5.2 Indirect approaches

Most studies that utilize the direct approach are focusing mainly on tax evasion in developed countries. To be able to obtain estimates of the informal economy (by any definition) that are comparable across countries there has been developed indirect methods that estimate the informal economy. Most of these methods are macroeconomic in nature and uses indicators or determinants to extract information on the development of the unobserved informal economy.

5.2.1 The expenditure-income discrepancy method

This expenditure-income discrepancy (residual) method compares the national statistics on income and expenditure. Theorizing that these two should be equal if the statistics were exhaustive, any discrepancy would arise from underreporting at the income-side of the national economy[3] (and preferably nothing else). This discrepancy could be taken as an estimate of the unobserved/hidden economy (GDP) that has not been reported to the central authorities. This method suffers from the

[3]This method also been applied at the household level, see O'Higgins (1989).

fact that the resulting estimate reflects any measurement errors that arise in the national accounting (of both expenditure and income) and that national account statisticians have an incentive to try to minimize this discrepancy. Inherent to the method is the assumption of higher expenditures than income; if this were to be violated, it would imply a negative hidden economy. Although there is little doubt that there is a relationship between this discrepancy and hidden activities, the method fails to take into account other factors that are important to the national accounts calculations. The discrepancy may e.g. reflect the behaviour of the tax authorities rather than hidden activities (Frey & Pommerehne 1984).

It is normally assumed that the measurement of the expenditure are independent and unbiased, but that assumption is found to be violated in many cases as large parts of the expenditure are estimated on the basis of retail sales and turnover (Smith 1986). Considering that national expenditure and income measures are crude estimates themselves, the expenditure-income discrepancy method must be regarded as a profoundly crude estimate.

According to O'Higgins (1989), the crude income-expenditure discrepancy or first initial (residual) difference may be divided into three parts:

1. underreporting of income

2. timing errors that arise when simultaneous events are recorded at different time periods

3. other estimating errors

The latter two are together termed the residual error and is found by controlling for underreporting. This residual shows a large degree of variability and weakens the estimates of the hidden economy, making it unfit to e.g. compute growth rates of the relative size of the hidden economy. Some of these residuals are negative in value, which makes them difficult to interpret in terms of tax evasion (Thomas 1992).

5.2.2 The discrepancy between the official and actual labour force

This method assumes that the official labour market and the informal labour market are tightly interconnected and that any changes in the size of the official labour force must be answered by an opposite change in the informal labour market (assuming that the total labour force is constant). This approach is criticized on the grounds that it excludes other determinants of changes in the labour market, which means that the assumption of a constant partition is dubious. Another point is that workers may be employed in both the official and informal economy (moonlighting) which makes the issue of measurement even more difficult (Schneider & Enste 2002, Frey & Pommerehne 1984).

5.2.3 The currency demand approach

One common hypothesis states that to remain hidden and undetected, people in the informal sector must use cash transactions to wipe out any trace of irregular economic activity (which are illegal by law). It is theorized that an increase in the size of the informal sector must lead to increased demand for currency to complete the additional transactions made. This has led to the development of monetary methods to measure the size of the informal sector.

The currency demand approach is one such monetary method. It is one of the most widely applied methods for estimating the size of the informal economy, and was first developed by Cagan (1958), who studied the relationship between currency demand and tax pressure in the United States before and during the second World War. This approach has been further developed to include econometric properties by Tanzi (1980, 1983). Comparing with a scenario with no informal sector, it is possible to derive an excess demand function that may be attributed to the informal sector's demand for cash:

$$\ln\left(\frac{C}{M_2}\right)_t = \beta_0 + \beta_1 \ln\left(1 + TW\right)_t + \beta_2 \ln\left(\frac{WS}{Y}\right)_t + \beta_3 \ln R_t + \beta_4 \ln\left(\frac{Y}{N}\right)_t$$

$$\text{with } \beta_1 > 1\,, \beta_2 > 0,\ \beta_3 < 0,\ \beta_4 > 0$$

C/M_2 is the ratio of cash holdings to current and deposit accounts, TW is weighted average tax rate (proxy for changes in the size of the informal sector), WS/Y is the proportion of salaries and wages in national income (captures changing payment and money holding patterns), R is the interest rate on saving deposits (opportunity cost) and Y/N is the per capita income. It may be expanded by including variables for the intensity of regulation, other taxes and the complexity of the tax system, which are important determinants of the informal sector (Schneider & Enste 2002).

Excess currency demand is the currency demand that is not explained by the factors above is then attributed to factors determining the size of the informal sector, such as increased tax burden or increased intensity of regulations. With the assumption that the velocity of currency is the same for both the official and informal sector, the size of the informal sector may be derived. Another important assumption is that there needs to be set a base year of the estimation for which the informal sector is non-existent. This happens when $TW = 0$, and the excess currency demand is found by comparing the currency ratio with and without the impact of the informal sector (proxied by the TW-term of the right hand side of the equation above).

The currency demand approach has several shortcomings:

- The velocity of money in the official economy is hard to quantify, the money velocity of the informal sector even more so. Furthermore, the estimation procedure is very sensitive to small changes in the money velocity (Klovland 1984).

- The assumption of a non-existent informal sector at any time period through history is questionable. Small changes in the base year may give rise to large differences in the estimated size of the informal sector. Moving the base year backwards in time increases the size of the informal sector at later periods. Thus the informal sector will be underestimated (Schneider 2005).

- Regarding the American economy this approach fails to take into account that American dollars are used outside of the US economy.

- Not all transactions in the informal sector are paid in cash, there are also e.g. non-monetary barter exchange. This is probably even more important in developing economies. This will also lead to an underestimation of the informal sector.

5.2.4 The transactions approach

This approach[4] is based on the assumption that there is a constant relationship between the volume of transactions and GNP. It utilizes Fisher's quantity equation $MV = pT$, where M is money, V is money velocity, p is prices and T is total transactions. It is assumed that the informal sector GNP may be found by taking the difference between total nominal GNP and the official GNP. A zero informal sector base year has to be determined (as in the currency demand method). In the absence of the informal sector, the ratio pT to official GNP is constant over time and may be characterized as normal. This method suffers from some of the same shortcomings as the currency demand method. Furthermore, one important weakness is that this approach demand precise data on transactions, which rarely are available. It is also problematic that this method relies on the assumption that all variation in the ratio between the total value of transactions and the official GNP comes in response to changes in the informal sector (Schneider & Enste 2002).

[4]See Feige (1996).

5.2.5 The electricity consumption approach

Some of the more recent approaches use physical inputs as indicators of all economic activity. One of them is Kaufmann & Kaliberda (1996) that uses the electricity consumption as an indicator for the overall economic activity. Subtracting official GDP growth from this measure of overall activity (growth in electric power consumption) reveals the magnitude of the informal sector. This gives us a very simple and appealing method to quantify the informal sector. It is however criticized on the basis that not all informal sector activity demands that much electricity; that other energy sources may be used; that it fails to take account of technical progress (more efficient use of energy); and that the elasticity of electricity to GDP may not be so stable across country and time (Schneider & Enste 2002). This is likely to be a larger problem when applying the method to less developed countries.[5]

5.3 MIMIC modelling

Considering that we use estimates derived from this method of quantifying the informal sector, the multiple indicators multiple causes model (MIMIC)[6] is important. However controversial (as most methods we have discussed), it is considered to be the most modern approach to informal sector estimation.

The previous methods has only used single indicators to capture the effects of the informal sector, but in the MIMIC framework one takes account of not only several indicators, but also several "cause variables" that determine the size of the informal sector. Thus the MIMIC approach is able to include the impact of not only the burden of taxation, but also the impact of the burden of state regulation, income differentials and other factors that may affect the development of the informal

[5] A similar method has been developed by Lackó (1998) which also uses electricity consumption, but takes account of differing consumption patterns across economies such that the informal sector have differing electricity consumption across economies.

[6] Also termed DYMIMIC in cases of dynamic time-series estimation.

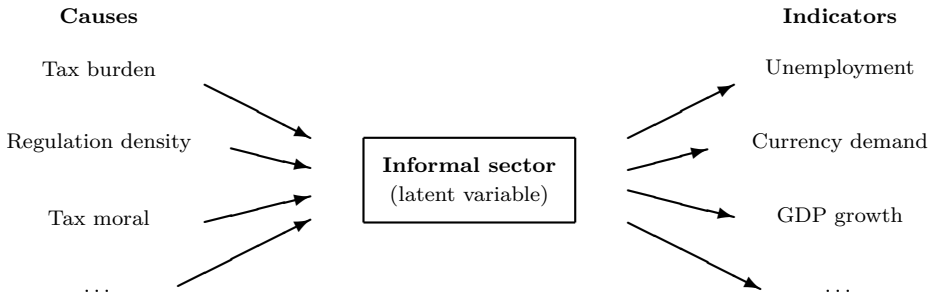

Figure 5.1: MIMIC model.

sector. In this way we may take into account the simultaneous effects driving the informal sector (by cause variables) and its effects on the indicators. This method is also sometimes labelled latent variable estimation since it estimates an unobservable and immeasurable (latent) variable by means of other observable variables (see figure 5.1 for an example of how the MIMIC model is constructed). This is done by a structural equation model consisting of two parts, a measurement model linking the unobserved variable (the informal sector) with a set of indicators; and a structural model, linking the unobserved variable with a set of cause variables that are thought to have an impact on the unobserved variable (Schneider & Enste 2002) We may formulate the MIMIC model as follows:[7]

$$\begin{aligned} y_t &= \lambda\eta_t + \varepsilon_t \\ \eta_t &= \gamma' x_t + \xi_t \end{aligned}$$

y_t is a vector of indicator variables, η is the unobserved latent variable (scalar), x_t is a vector of cause variables. γ and λ are unknown coefficient vectors. To be able to obtain estimates from this model we need to use a normalization condition. There are several ways of doing this, e.g. Schneider (2005) assumes that the first element of λ if equal to -1 (thus assuming that the coefficient on the latent variable from the first indicator is equal to -1). The resulting estimates produces only relative

[7]Found in Breusch (2005b).

values of the latent variable, it is therefore needed to calibrate[8] the time-series estimates (in the case of DYMIMIC estimation) to obtain values of the latent variable in units of observation that are relevant to the context (e.g. the share of informal sector to GDP). This is often done by anchoring the value of the latent variable at some point in time, e.g. by using some average value of the size of the informal sector obtained by the currency demand method or perhaps by taking the average estimate from a range of methods.

The MIMIC method has been criticized on several points. Probably the most important point of criticism is the one regarding the calibration of the estimates produced by the MIMIC method (Dell'Anno & Schneider 2006). According to Breusch (2005b) "[t]he data are typically transformed in ways that [...] have the unfortunate effect of making the results of the study sensitive to the units to which the variables are measured." Understanding how the calibration procedure is performed is therefore substantive when evaluating MIMIC estimates of the informal sector.[9]

5.4 Controversy of measurement

According to Thomas (1999), there is a genuine lack of theory applied in the literature that seeks to estimate the size of the hidden economy. This has profound implications since this renders the estimates useless for policy-makers since there is no theoretical framework to tell us what it means to have an guesstimated hidden economy at 20 per cent of GDP.[10] In his concluding remarks, Thomas (1999) emphasizes that one should take note of the microeconomic implications when considering the large macro-numbers that is found in much of the hidden economy literature. On how to interpret the guesstimates of Feige (1981), he states that

[8] Often coined benchmarking.

[9] Dell'Anno & Schneider (2006) suggests some new "benchmark" procedures.

[10] Journalists however, knows what to do with these numbers.

Method	Canada				Germany				Great Britain			
	1970 -75	1976 -80	1981 -85	1986 -90	1970 -75	1976 -80	1981 -85	1986 -90	1970 -75	1976 -80	1981 -85	1986 -90
Surveys of households	-	-	1.3	1.4	3.6	-	-	-	1.5	-	-	-
Tax auditing	-	-	2.9	-	-	-	-	-	-	-	-	-
Discrepancy bet. exp. and income	-	-	-	-	11.0	10.2	13.4	-	2.5	3.6	4.2	-
Employment discrepancy	-	-	-	-	23.0	38.5	34.0	-	-	-	-	-
Physical input	-	-	-	11.2	-	-	-	14.5	-	-	-	13.2
Currency demand	5.1	6.3	8.8	12.0	4.5	7.8	9.2	11.3	4.3	7.9	8.5	9.7
Cash deposit ratio	13.8	15.9	11.2	18.4	-	-	-	-	14.0	7.2	6.2	-
Transactions	-	26.5	15.4	21.2	17.2	22.3	29.3	31.4	17.2	12.6	15.9	-
MIMIC	-	8.7	-	-	5.8	6.1	8.2	-	-	8.0	-	-

Values are groups (averaged when possible) in time periods in order to undertake a rough comparison. The cash deposit ratio method is a forerunner to the currency demand method.
Sources: See Schneider & Enste (2000).

Table 5.1: A comparison of estimates of different methods.

> "Rather than accepting these magic numbers we should ask the obvious microeconomic questions: Are we seriously expected to believe that the production of goods and services in the black economy could increase from 8% of GDP in 1971 to 22% in 1974 and then fall to 14% in 1975 without being observed? Where was this all happening? Who was doing it and how were they hiding their activities? What are the implications for policy makers - what should they do? Without an answer to such questions we should be sceptical and, in particular, resist the use of anecdotal evidence to support such claims"

This hits right at the hart of the problems with estimating the informal sector. It is not just one single entity that is observable to those who operate within (or outside) it, and its properties may not be constant over time. One should therefore not just accept such figures when there is no framework to interpret these results, and no fully accepted theoretical models to explain the dynamics and mechanics underlying these figures. Many economists in the field seem however to be aware of this, and stresses that this is a discipline in development and that one should interpret and use these estimates with much caution.

Method	Italy				United States			
	1970 -75	1976 -80	1981 -85	1986 -90	1970 -75	1976 -80	1981 -85	1986 -90
Surveys of households	-	-	-	-	3.7	4.5	5.6	-
Tax auditing	3.0	3.9	-	10.0	4.9	6.3	8.2	10.0
Discrepancy bet. exp. and income	3.2	4.3	-	9.3	3.2	4.9	6.1	10.2
Employment discrepancy	-	18.4	-	-	-	-	-	-
Physical input	-	-	-	19.3	-	-	7.8	9.9
Currency demand	11.3	13.2	17.5	21.3	3.5	4.6	5.3	6.2
Cash deposit ratio	23.4	27.2	29.3	-	8.8	11.2	14.6	-
Transactions	19.5	26.4	34.3	-	17.3	24.9	21.2	19.4
MIMIC	-	10.5	-	-	-	8.2	-	-

Continued from table 5.1.

Country	Loaysa 1990-93	Schneider 1990-91	Absolute difference
Argentina	21.8	22.1	0.3
Bolivia	65.6	55.4	10.2
Brazil	37.8	32.5	5.3
Chile	18.2	13.6	4.6
Colombia	35.1	33.4	1.7
Costa Rica	23.3	22.0	1.3
Ecuador	31.2	28.9	2.3
Guatemala	50.4	41.4	9.0
Honduras	46.7	40.7	6.0
Mexico	27.1	24.1	3.0
Panama	62.1	51.4	10.7
Peru	57.9	47.1	10.8
Uruguay	35.2	41.3	6.1
Venezuela	30.8	27.4	3.4

Sources: Loaysa (1996) and Schneider & Enste (2000).

Table 5.2: A comparison of MIMIC estimates.

Chapter 6

Empirical studies of informality and development

There has been little empirical work on the relationship between informality and development (measured by income (GDP) growth). Here we shall take a look at the work of two studies of this subject, by Loaysa (1996) and Schneider (2005).

6.1 Informality and growth in Latin-America

Loaysa (1996) develops a theoretical model[1] of endogenous growth and informality. Subsequently he estimates the size of the informal sector using the MIMIC modelling approach[2], and uses these estimates as an independent variable in a regression on GDP growth. The hypothesis that is put forward is that policies or government institutions that promote an increase in the informal sector will also reduce the growth rate of the economy. The relationship between GDP growth, informal activity, taxes and the quality of institutions[3] is studied in the cross-country

[1]This model is discussed in section 4.4.

[2]These estimates are found in table 5.2.

[3]The public infrastructure index consists of per capita electricity consumption, per capita telephone mainlines, percentage of population with access to safe water and per capita road in

Dependent variable	GDP per capita growth rate 1980-92				Public infrastructure
Size of the informal sector	-0.8852		-0.8435		-05814
	(-2.61)*		(-2.16)*		(-2.98)*
Public infrastructure index		0.5622	0.0718		
		(1.69)+	(0.24)		
Corporate income tax rate				-0.4436	
				(-1.09)	
Labour-market restrictions				-0.4333	
				(-0.84)	
Strength and efficiency of government institutions				0.3598	
				(1.16)	
P-value (F-statistic)			0.0233	0.0798	
Adjusted R^2	0.3584	0.1201	0.3068	0.2537	0.3381
Number of observations	14	14	14	14	14

The above t-statistics are computed using heteroskedasticity-corrected standard errors. Regression coefficients are standardized so that they reflect the change in the growth rate produced by a one-standard deviation of the explanatory variable. +: significant at 10%; *: significant at 5%.
Source: Loaysa (1996).

Table 6.1: Growth effects of public infrastructure and informal sector.

regression (see table 6.1). Despite very few observations (only 14 countries), the results are fairly strong. The size of the informal sector has a negative impact on GDP growth, even when accounting for the public infrastructure index. A negative relationship is also established between the index and the informal sector. This may explain why it seems like the informal sector variable removes the explanatory power of the index in the growth regression. A regression with the determinants of the informal sector replacing the informal sector and public infrastructure index shows that the variables have the expected signs, but they are not individually significant (which may be due to multicollinearity according to the author).

To check that the informal sector variable is not a proxy for some other underlying determinant of growth, Loaysa (1996) performs a regression on growth using the informal sector variable and other plausible determinants (shown in table 6.2). Still the informal sector has a significantly negative impact on GDP growth in Latin-American countries.

---

good condition.

Dependent variable	GDP per capita growth rate 1980-92				
Size of the informal sector	-1.282	-1.3165	-1.3303	-1.4555	-1.2245
	(-3.33)*	(-4.30)*	(-3.79)*	(-3.45)*	(-3.44)*
Real GDP per capita, 1980	-0.6418	-0.7956	-0.8906	-0.1523	-1.9685
	(-2.04)*	(-2.92)*	(-2.80)*	(-3.84)*	(-4.33)*
Secondary school		0.4302	0.7341	0.8426	0.7118
attainment, 1980		(1.86)+	(2.32)*	(2.66)*	(2.43)*
Average tariff for			-0.5226	-0.6138	-0.3439
Intermediate and			(-1.26)	(-1.49)	(-0.86)
capital goods, 1985					
Average inflation rate				-0.2497	-0.6027
1980-92				(-0.46)	(-1.60)
Public infrastructure index,					1.1966
1990					(2.04)*
P-value (F-statistic)	0.0046	0.0077	0.0305	0.0724	0.0365
Adjusted R^2	0.4595	0.5119	0.5222	0.4735	0.6490
Number of observations	12	12	12	12	12

The above t-statistics are computed using heteroskedasticity-corrected standard errors. Regression coefficients are standardized so that they reflect the change in the growth rate produced by a one-standard deviation of the explanatory variable. +: significant at 10%; *: significant at 5%.
Source: Loaysa (1996).

Table 6.2: The informal sector and other determinants of growth.

6.2 The informal sector worldwide

In the next chapter we will perform an econometric analysis of the impact of the informal sector on GDP growth using the MIMIC estimates that are produced by Schneider (2005); who also uses these estimates in a panel regression of GDP growth together with other common determinants[4] of growth (see table 6.3). This analysis will therefore act as a benchmark for our empirical analysis. Schneider (2005) finds that the informal sector has a significantly negative impact on growth in low-income (developing) countries, but that the effect is significantly positive for industrialized and transition countries. The estimated coefficients predict that a one percentage point increase in the informal sector to GDP will increase the GDP per capita growth rate by 7.7 per cent in high-income and transition countries, but reduce the growth by 5.2 per cent in developing countries. The author attributes

[4]Schneider (2005) refers to Barro and Sala-i-Martin (1995) and Breton (2001) regarding his choice of variables.

Dependent variable: Annual GDP per capita growth rate		
Shadow economy industrialized countries	0.077** (2.63)	
Shadow economy transition countries		0.099** (3.80)
Shadow economy developing countries	-0.052** (2.37)	-0.045** (2.36)
Openness	0.012**(2.14)	
FDI lagged		0.00049 (0.05)
Inflation rate other countries	0.023 (1.32)	0.0263 (1.28)
Inflation rate transition countries	-0.021** (4.10)	-0.021** (-3.69)
Government consumption	-0.181** (3.23)	-0.184** (3.25)
Lagged annual GDP per capita growth rate	0.154** (3.06)	0.154** (3.06)
Total population	0.000036** (2.07)	0.000036* (1.80)
Capital accumulation rate	0.019* (1.88)	0.015 (1.42)
Constant	0.062** (4.13)	0.06** (5.00)
Countries	104	83
Overall R-squared	0.347	0.3211
Within R-squared	0.266	0.263
Between R-squared	0.417	0.443
Wald-χ^2	94.63 (0.000)	73.89 (0.000)

Random effects GLS-regressions; absolute value of z-statistics in parentheses, *: significant at 10%; **: significant at 5%. Industrialized countries consist of transition countries and high-income countries. Source: Schneider (2005).

Table 6.3: GDP growth and the shadow economy.

this to the relief of burdening taxes for high-income country entrepreneurs, and to the eroded tax base in developing countries which reduces the provision and quality of public goods, conforming with the reasoning made by Loaysa (1996) (see section 4.4).

Chapter 7

Empirical study

7.1 Data

All of the data is found in the World Bank's World Development Index (WDI) databank; except for the data on the institutional variables. The Democracy variable is from Freedom House and the Rule of Law variable is from The International Country Risk Guide, published by The PRS Group.[1] The data are yearly and are averaged over the years 1990-91, 1994-95 and 1999-2000 to comply with the time frame of the informal sector estimates that we find in Schneider (2005). In cases where we have missing observations, the values are interpolated by taking the average of the adjacent observations. No extrapolations are made, and some countries are therefore dropped due to missing data, mostly due to lack of data in the period 1988-1991. Growth rates are computed using the formula

$$g = \frac{(y_t - y_{t-1})}{y_{t-1}}$$

[1] A description of the variables and their sources is presented in the appendix, along with the data of the size of the informal sector, GDP per capita, and GDP per capita growth.

7.2 Empirical Strategy

We will use Stata Intercooled 9.0 to perform fixed and random effects regressions.[2] The benchmark specification that we shall use is:

GDP per capita growth rate =
Informal sector in industrialized[3] countries *or* only in transition countries + Informal sector developing countries + Lagged log GDP per capita + Openness + Inflation rate other countries + Inflation rate transition countries + Government Consumption + Total population + Capital accumulation rate + Year dummies

This specification is generally comparable to the one used by Schneider (2005) (see table 6.3) except for one important difference: We use lagged log of GDP per capita instead of lagged growth.[4] This is because we want to control for growth convergence, which is typically done in empirical growth models. Convergence in this context means that we believe that low-income countries will have higher growth than high-income countries due to a higher growth potential, thus catching up (slowly) with richer countries over time. Hence we expect the coefficient on lagged income to be negative. Conforming with Schneider (2005), we expect the other signs on the estimated coefficients to be positive for the informal sector in industrialized and transition countries, for openness, lagged GDP growth, population and capital accumulation. The informal sector in developing countries, inflation and government consumption are believed to have a negative impact on GDP growth. We agree with Schneider (2005) on these expectations except for the presumed negative impact of government consumption. We believe that governmental consumption (and thus investment) in itself cannot be bad for growth,

[2]These panel data models are described in appendix B.

[3]The group of industrialized consist of transition and developed high-income countries.

[4]Why Schneider (2005) uses lagged growth is unknown as he does not justify its use. This could potentially be harmful for the analysis since the lagged dependent variable is correlated with the country specific effect, which makes the slopes estimator inconsistent (see appedix B). For comparative purposes we have also performed regressions including the lagged growth rate, see appendix C.

but rather the opposite. However, we also acknowledge that not all governmental consumption in the world is used to promote growth; the overall effect is therefore ambiguous.

In addition to the specification used by Schneider (2005), we include year dummies so that we are able to isolate the period-specific effects. This is done to pick up any period-specific effects (trends) that are not caused by the other variables of interest. Note that we use the same grouping of countries as Schneider (2005).[5] Besides the use of year dummies and substituting the lagged growth rate, the econometric model and especially the underlying data should be the same as in the analysis of Schneider (2005).[6] Thus we expect to get roughly the same results for the benchmark specification as we have presented in table 6.3.

There are several types of data we would like to include in a econometric growth model that is unavailable to us. Most importantly is the lack of data on human capital (such as schooling and health) and technological growth (inventions). Considering that we are interested in the development of poor countries, it would be appropriate to include data on e.g. poverty or indices such as the human development index. The problem is that data is not collected in the relevant time periods or it is too much data missing. For instance, there is no data on male secondary schooling[7] for the years 1994 and 1995, and very little from the years 1990-1991.

There are also some variables that are available to us that is not included in the specification in Schneider (2005), and that is the institutional variables for political rights (or democracy) and the rule of law. These variables are emphasized in e.g. Barro and Sala-i-Martin (2004) as having a significant importance for GDP growth empirically. Especially the democracy variable is found to be important for growth (particularly for those countries that scores low on the democracy in-

[5] As the only country, Slovenia is in both the high-income and transition group. In our analysis we do not include this country when high-income countries are left out of the regression.

[6] Checking the reported sources of Schneider's (2005) suggests that our WDI data are from the same databases. This may not be the case however: See appendix D.

[7] This kind of data is often the most readily available data on educational attainment.

dex). Thus we would want to include these variables as well into the benchmark specification.[8]

This means that we will run several regressions: First we will run the benchmark regressions with and without the high-income countries; second, we will run the same regressions including the institutional variables *rule of law*, *democracy* and *squared democracy*; and third, we will perform these regressions with both the fixed and random effects models. A Hausman test of specification will determine which model is the appropriate one to use.

7.3 Results

7.3.1 Fixed effects

First we will consider the results of the fixed effects regressions. Looking at the results of the benchmark regression which divides between low and high-income countries (column (1) in table 7.1), we see that all variables have the expected signs, but that only half the coefficients are significantly different from zero. Our results supports the findings of Schneider (2005) that found a positive impact of informality on growth in high-income countries and a negative impact on growth in developing countries. Unfortunately the coefficient on the informal sector in industrialized countries is not significant. Assuming that the informal sector increases by one percentage point to GDP increases GDP growth with 0.089 percentage points. Using the average growth rate in the industrialized group of 3.80%, this means that the effect of informality is a 2.26% increase of the growth rate in "industrialized" countries which is somewhat less than the estimated effect of 7.7% in Schneider (2005). The same relative increase in the informal sector in developing countries leads to a 0.42 percentage point reduction of the growth rate. This amounts to an

[8]There are other such institutional variables that could have been interesting to use, such as the World Bank's Governance indicators, but this data only goes back to 1996.

average growth reduction of 9.93% (5.2% in Schneider (2005)).[9]

Comparing the other coefficients we see that almost all of the variables have much smaller coefficient values than compared to Schneider (2005). The exception is capital accumulation, which is about 2.5 times larger. The coefficients on inflation and government consumption are particularly small here by our estimates.

Removing the high-income economies (see column (5) in table 7.2) does not change the results much; most coefficients retain the same level as in the previous specification. The exception here is that the informal sector coefficients are now both larger. Although the coefficient is not significant, we note that an increase in the informal sector by one percentage point to GDP in transition countries leads to an increase in the GDP growth rate of 0.20 percentage points. The coefficient on informality in developing countries is highly significant and shows a negative effect of increasing informality of 0.72 percentage points.[10]

Adding the institutional variables (in (2) and (6)) changes the results somewhat. More variables are now statistically significant, suggesting that the institutional variables improve the fit of the regression model. We also note that the effect of informality in transition and high-income countries now are negative and much larger in absolute value than in the benchmark regressions. Although these coefficients are still insignificant, their standard errors are much lower compared to the coefficients in the benchmark specification. In levels, we find that increasing the informal sector with one percentage point to GDP decreases the industrialized countries' growth rate with 0.38 percentage points. The coefficient on informality in developing countries remains unchanged by controlling for institutional quality, but several of the other coefficients increase considerably in absolute size and significance. The institutional coefficients are themselves not significant and they do not have the expected signs. Normally, we expect the coefficient on rule of law and democracy to be positive, reflecting that improving the judicial system and

[9]The average GDP growth rate in developing countries is 4.25%.

[10]With an average growth rate of 4.25% this effect amounts to a 17% decrease of GDP per capita growth.

political rights of the citizens will improve growth, while the squared democracy is normally thought to be negative, reflecting that highly democratic economies are adversely affected by improving the political rights (Barro and Sala-i-Martin, 2004) since the cost of changing the political institutions outweighs the benefits.

However, the overall effect[11] of the democracy variables is positive, meaning that a move from a completely totalitarian system to a fully democratic society will improve growth with 1.01 percentage points in (2) and 1.07 percentage points in (6). We cannot argue in the same manner for the effect of the rule of law: Moving from anarchy to a perfectly well functioning judicial system reduces GDP per capita growth with something between 1.17 and 0.47 percentage points. This makes little sense.[12] However, according to Barro and Sala-i-Martin (2004), the rule of law has long term effects that lasts a long time. It may be that the timeframe of analysis is to narrow to to capture such long term effects. Barro and Sala-i-Martin (2004) uses ten-year periods, averaging growth and comparing it across decades, which make it possible to capture long-term effects of the independent variables. This may also be an advantage since this averaging may remove short term cyclical fluctuations in the macroeconomic indicators.[13]

7.3.2 Random effects

Running a Hausman test of specification we may determine which of the fixed or random effects models we should use.[14] For all the regression specifications we have performed, we find that the fixed effects model should be preferred. Our test thus contradicts Schneider (2005) that rather uses the random effects GLS

[11] Computed by adding the democracy variables assuming a change from 0 to 1 in the democracy index.

[12] Arguably, the negative impact of the rule of law may be attributed to some other short term factors that are correlated to the rule of law. Or, it may be that there is some political unrest associated with the improvement of the judicial system, affecting the economic environment adversely.

[13] See appendix C for an analysis taking the same approach as Barro and Sala-i-Martin (2004).

[14] We discuss this test in appendix B.

	Fixed effects models		Random effects models	
	(1)	(2)	(3)	(4)
Informal sector in industrialized countries	0.00086	-0.00383	-0.00075	-0.00006
	(0.31)	(1.50)	(2.86)**	(0.17)
Informal sector in developing countries	-0.00422	-0.00480	-0.00053	-0.00059
	(2.05)**	(2.68)**	(2.23)**	(1.99)**
Lagged log of GDP per capita	-0.11879	-0.08280	0.00128	-0.00356
	(5.21)**	(3.59)**	(0.46)	(0.92)
Openness	0.00033	0.00042	0.00013	0.00023
	(1.46)	(2.07)**	(2.11)**	(2.79)**
Inflation rate other countries	-1.11e-05	-2.64e-05	-8.04e-06	-2.42e-05
	(1.49)	(2.07)**	(1.29)	(1.46)
Inflation rate transition economies	-4.78e-05	-0.00053	-2.63e-05	-0.00028
	(3.85)**	(2.86)**	(2.57)**	(2.66)**
Government consumption	0.00071	0.00150	-0.00028	0.00036
	(0.73)	(1.72)*	(0.62)	(0.71)
Total population	8.93e-07	-4.90e-07	3.71e-07	4.37e-07
	(0.32)	(0.20)	(2.41)**	(2.42)**
Capital accumulation	0.06793	0.07289	0.10648	0.09167
	(4.20)**	(4.92)**	(8.09)**	(7.13)**
Rule of law		-0.00468		-0.02284
		(0.30)		(1.92)*
Democracy		-0.02726		-0.03953
		(0.56)		(1.15)
Squared democracy		0.03815		0.04168
		(0.85)		(1.29)
Constant	1.04696	0.79920	0.03262	0.07006
	(4.90)**	(3.85)**	(1.19)	(2.05)**
Observations	302	277	302	277
Number of countries	106	102	106	102
R^2 (within)	0.39	0.41	0.19	0.32
F/Wald χ^2 test of specification	10.67	7.84	119.28	98.73
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Hausman χ^2			97.13	31.04
			(0.0000)	(0.0019)

Fixed effects regression and Random effects (GLS) estimation. Dependent variable is real GDP per capita growth rate. Absolute value of t statistics in parentheses. * significant at 10%; ** significant at 5%. The year dummies for 1994-95 have the estimated coefficients 0.00867 (0.85), 0.01703 (1.78)*,-0.01183 (2.08)**, 0.00015 (0.03), and for 1999-2000 0.05237 (3.00)**, 0.04727 (3.06)**, 0.01261 (2.12)**, 0.00976 (1.71)*. For the fixed effects specifications the F-test of specification is reported, while the Wald χ^2 is reported for the fixed effects regressions.

Table 7.1: GDP growth and the informal sector.

	Fixed effects models		Random effects models	
	(5)	(6)	(7)	(8)
Informal sector in transition countries	0.00195	-0.00751	-0.00080	-0.00003
	(0.42)	(1.50)	(2.54)**	(0.09)
Informal sector in developing countries	-0.00722	-0.00704	-0.00048	-0.00056
	(2.43)**	(2.67)**	(1.66)*	(1.63)
Lagged log of GDP per capita	-0.10282	-0.10417	-0.00069	-0.00228
	(3.11)**	(3.20)**	(0.19)	(0.49)
Openness	0.00014	0.00029	0.00017	0.00023
	(0.50)	(1.11)	(1.75)*	(2.13)**
Inflation rate other countries	-1.14e-05	-1.36e-05	-6.76e-06	-7.95e-06
	(1.36)	(1.88)*	(0.95)	(1.23)
Inflation rate transition economies	-3.82e-05	-0.00057	-2.37e-05	-0.00027
	(2.54)**	(2.37)**	(2.01)**	(2.20)**
Government consumption	0.00107	0.00189	-0.00042	0.00059
	(0.97)	(1.86)*	(0.70)	(0.92)
Total population	-6.30e-07	-3.94e-07	4.10e-07	4.42e-07
	(0.19)	(0.14)	(2.31)**	(2.21)**
Capital accumulation	0.06823	0.06771	0.10159	0.09297
	(3.54)**	(3.73)**	(6.50)**	(6.05)**
Rule of law		-0.01173		-0.03146
		(0.57)		(2.03)**
Democracy		-0.03280		-0.04106
		(0.59)		(1.04)
Squared democracy		0.04351		0.03770
		(0.83)		(1.00)
Constant	0.96486	1.03200	0.04438	0.05838
	(3.19)**	(3.55)**	(1.34)	(1.49)
Observations	225	204	225	204
Number of countries	80	77	80	77
R^2 (within)	0.43	0.44	0.20	0.33
F/Wald χ^2 test of specification	9.08	6.24	78.66	65.96
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Hausman χ^2			68.72	50.25
			(0.0000)	(0.0000)

Fixed effects regression and Random effects (GLS) estimation. Dependent variable is real GDP per capita growth rate. Absolute value of t statistics in parentheses. * significant at 10%; ** significant at 5%. The year dummies for 1994-95 have the estimated coefficients 0.02000 (1.47), 0.03121 (2.37)**, -0.01123 (1.51), 0.00575 (0.74), and for 1999-2000 0.07334 (2.90)**, 0.07326 (3.19)**, 0.01465 (1.89)*, 0.01427 (1.85)*. For the fixed effects specifications the F-test of specification is reported, while the Wald χ^2 is reported for the fixed effects regressions.

Table 7.2: GDP growth and the informal sector. Without the high-income countries.

	1990-91		1994-95		1999-2000	
Informal sector in industrialized countries	-0.00308		-0.00217		0.00076	
	(5.00)**		(4.11)**		(2.84)**	
Informal sector in transition countries		-0.00404		-0.00257		0.00079
		(5.62)**		(4.04)**		(2.53)**
Informal sector in developing countries	-0.00128	-0.00075	-0.00047	-0.00059	0.00003	0.00005
	(2.67)**	(1.33)	(1.11)	(1.19)	(0.11)	(0.16)

Table 7.3: GDP growth and the informal sector. 1990-2000.

model. This is quite surprising since we find that the country specific effects are closely correlated with the regressors, and since the results of our random effects regressions are quite different from the results of Schneider (2005):

- All informal sector coefficients are negative, clearly contradicting Schneider (2005). The level of the informal sector's influence is also quite smaller in all specifications compared to both the fixed effects regressions and even more compared to the random effects results in Schneider (2005).
- In the regressions including the institutional variables, we find that the effect of the informal sector becomes insignificant in the high-income countries (in (4) and (8)) and also in developing countries in (8).
- In column (3), we see that the coefficient on lagged GDP is positive; thus contradicting the convergence hypothesis. The other coefficients have the expected signs.

7.3.3 OLS regression for each period

To further the analysis we separate our data into the three time periods and run OLS on them. The results are presented in table 7.3 where we only report the coefficients on the relative size of the informal sector. The results differs little from the regressions including institutional variables.[15]

Using the benchmark specification for the period 1990-91 we find that the informal

[15]Not reported here.

sector has a negative effect on the GDP per capita growth in general. The results are most pronounced for the industrialized and transition groups, showing that a one percentage point increase of the relative size of the informal sector leads to about 0.3 percentage points reduced growth. Including the high-income countries we find that the effect of the informal sector is about 0.1 percentage points in developing countries.

In 1994-95 the coefficients on the informal sector are still negative. The absolute levels of the coefficients are generally smaller. The coefficients on developing country informality are now insignificant independent on whether we include the high-income countries or not.

Looking at the results for the OLS regressions in 1999-2000 the results have changed. Although most coefficients are smaller, they are now positive, indicating a positive effect of increasing informality worldwide. The effect of the informal sector in "industrialized" countries is at 0.0008 percentage points (both with and without high-income countries). The effect of informality on growth in developing countries is close to zero.

7.4 Critical remarks

How can we explain that the informal sector influences growth negatively at the beginning of the last decade and positively at the end of it? As we have already argued, there are many effects of informality; some being positive and others negative. Determining which of these effect that are determining the overall effect on growth is difficult to tell based on the relatively crude analysis we provide here. Furthermore, informality may proxy other important effects on growth not taken account of in our specification. Such effects may be both positive and negative.

As previously discussed, business cycles may affect our results and disguise otherwise significant relationships. GDP (per capita) growth rates are quite volatile,

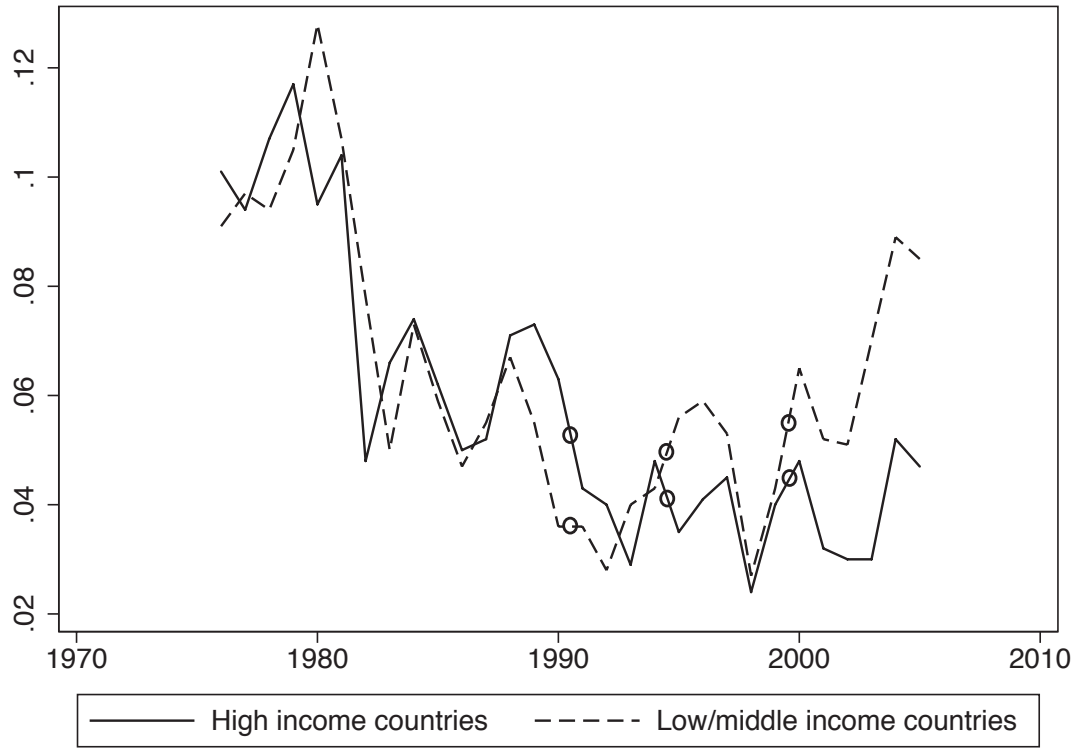

Figure 7.1: GDP per capita growth rate 1976-2005.
Yearly data. Source: World Bank (WDI).

and it may be argued that we should rather use long-term growth as a dependent variable in our analysis, instead of using yearly data. In figure 7.1 we display GDP growth for high-income countries and low to medium income countries. The data that we use in our analysis is marked at the time of observation. We see that averaging over e.g. decades or 5-year periods would produce quite different growth data, and could possibly give a better indication of the long-term tendencies (of development). It is conceivable that this kind of data would respond quite differently to changes in the size of the informal sector. There is, after all, more support from researchers of the notion of the mostly negative long term effects of informality, such as decreasing productivity, lower tax morality and reduced support of the government by the citizens.

Another important weakness of our analysis is the general weakness inherent to cross-country comparative analysis. One problem is that we have few observations; and although we have over a hundred countries in three periods in our data set, it would improve the statistical properties of our analysis profoundly if we had a thousand countries over several decades. Furthermore, establishing macroeconomic relationships in a cross-country context is difficult, especially in our case where we look at the informal sector that arguably is differing widely between countries, not only in size but also in nature. The types of individuals that engage in informal activities differs, the kind of activities they engage in differs, their motives and incentives for entering the informal sector differs, and the governments respond to these agents and activities differently. The effect that informality has on growth will naturally differ between countries and these effects will not be exposed properly in a cross-country analysis.

Chapter 8

Conclusion

How does informality affect development? According to our estimates the informal sector seems to slow GDP growth in developing countries, where a one percentage point increase in the informal sector to GDP leads to 0.42 percentage points lower GDP growth. The effect of informality is less clear in developed and transition countries where we fail to uncover any significant effects of informality. The estimated impact of a one percentage point increase in the informal sector relative to GDP is 0.086 percentage points higher GDP growth. This effect becomes negative when we account for the influence of institutional quality. We conclude that informality seems to be negative for growth in developing countries, but not in high-income and transition economies where informality does not seem to influence growth significantly. This contradicts the reported results in Schneider (2005) where informality is found to promote growth significantly in both high-income and transition economies.

Considering that the effects of informality are likely to be worse in the long term, we believe that it is an important issue that should be taken seriously. The increase of the informal sector that we see all over the world should therefore be addressed by economists and researchers in other fields of science. We will however not make any recommendations to policy-makers since our results are based on the highly controversial MIMIC estimates that are too uncertain to be trusted blindly.

The methods applied to measure the size and extent of informality is still at its infancy, and without further development in this line of research we should question whether such measurements have any practical purpose besides creating debate and sensational headlines. It is also important to emphasize that without a general theory on how informality or the informal sector works with the formal economy, we cannot put these results in perspective.

Appendix A

Variables description and data

All variables except the shadow economy, democracy and rule of law are obtained from the World Development Index (WDI) database. The sources of the WDI data are stated below.

GDP per capita on PPP basis

GDP per capita is based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the US dollar has in the United States. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current dollars.

Source: World Bank, International Comparison Programme database.

Lagged log of GDP per capita

Computed using the GDP per capita data.

Source: World Bank, International Comparison Programme database; own calculation.

Annual GDP per capita growth rate

Computed using the GDP per capita data for the observed 109 countries over the years 1988 to 2000. A lagged GDP growth variable is also computed.

Source: World Bank, International Comparison Programme database; own calculation.

Informal sector

The variable Informal sector (or shadow economy) is defined as the share of the informal sector to the official GDP. The estimations for the size of the informal sector are undertaken using the DYMIMIC and the currency demand approaches. This variable is available for three points in time; in 1990/1991, 1994/1995 and 1999/2000.

Source: Schneider (2005).

Informal sector industrialized countries

The variable Informal sector industrialized countries has the value 0 if a country is a developing country [indicated by the value 0 in the dummy industrialized countries] and the value of the informal sector as a percentage of GDP if a country is an industrialized country [indicated by the value 1 in the Dummy Industrialized Countries] or a transition country [indicated by the value 1 in the Dummy Transition Countries].

Source: Own calculation.

Informal sector developing countries

The variable Informal sector developing countries has the value 0 if a country is an industrialized country [indicated by the value 1 in the Dummy industrialized country] or a transition country [indicated by the value 1 in the dummy transition country] and the

value of the informal sector as a percentage of GDP if a country is a developing country [indicated by the value 0 in the dummy industrialized country].

Source: Own calculation.

Openness

Openness is the sum of exports and imports of goods and services measured as a share of gross domestic product.

Source: World Bank national accounts data, and OECD National Accounts data files.

Inflation rate, GDP deflator

Inflation as measured by the annual growth rate of the GDP implicit deflator, which shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.

Source: World Bank national accounts data, and OECD National Accounts data files.

Inflation rate other countries

Inflation rate other countries is defined as inflation rate but has the value 0 if a country is a transition country [indicated by the value 1 in the transition countries dummy] and the value of the inflation rate if a country is a non-transition country [indicated by the value 0 in the transition countries dummy].

Source: World Bank national accounts data, and OECD National Accounts data files; own calculation.

Inflation rate transition countries

Inflation rate transition countries is defined as inflation rate but has the value 0 if a country is a non-transition country [indicated by the value 0 in the transition countries

dummy] and the value of the inflation rate if a country is a transition country [indicated by the value 1 in the transition countries dummy].

Source: World Bank national accounts data, and OECD National Accounts data files; own calculation.

Government consumption

Government consumption is defined as general government final consumption expenditure and includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defence and security, but excludes government military expenditures that are part of government capital formation.

Source: World Bank national accounts data, and OECD National Accounts data files.

Total population in millions

Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship; except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin.

Source: World Bank staff estimates from various sources including census reports, the United Nations Statistics Division's Population and Vital Statistics Report, country statistical offices, and Demographic and Health Surveys from national sources and Macro International.

Gross capital formation

Gross capital formation (GCF; formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial

and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. GCF data are in current U.S. dollars.

Source: World Bank national accounts data, and OECD National Accounts data files.

Capital accumulation rate

The Capital Accumulation Rate is the annual growth rate of gross capital formation.

Source: World Bank national accounts data, and OECD National Accounts data files; own calculation.

Investment ratio

The Investment ratio is the share of gross capital formation to GDP.

Source: World Bank national accounts data, and OECD National Accounts data files; own calculation.

Terms of trade adjustment

Definition: The terms of trade effect equals capacity to import less exports of goods and services in constant prices. Data are in constant local currency.

Source: World Bank national accounts data, and OECD National Accounts data files.

Total fertility rate

Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates.

Source: World Bank staff estimates from various sources including census reports, the United Nations Statistics Division's Population and Vital Statistics Report, country

statistical offices, and Demographic and Health Surveys from national sources and Macro International.

Reciprocal of life expectancy

Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.

Source: World Bank staff estimates from various sources including census reports, the United Nations Statistics Division's Population and Vital Statistics Report, country statistical offices, and Demographic and Health Surveys from national sources and Macro International.

Rule of law

The Law and Order variable comes from a subjective measure provided in the International Country Risk Guide that is published by Political Risk Services (PRS). The underlying data is tabulated into seven categories, which has been adjusted to a zero-to-one scale, with one representing the most favourable environment for maintenance of the rule of law.

Source: The PRS Group; own calculation.

Political rights, democracy

The Democracy variable comes from a subjective measure provided by Freedom House. The underlying data are tabulated into seven categories, which has been adjusted to a zero-to-one scale, with one representing a fully representative democracy and zero a complete totalitarian system.

Source: Freedom House; own calculation.

Squared democracy

The squared Democracy variable allows for non-linear effects of the democracy variable.

Source: Freedom House; own calculation.

Dummy high-income countries

The variable dummy high-income countries is a binary variable that takes the value 0 if a country is a developing country and 1 if the country is a high-income country. A country is defined to be in this group if it is in the high-income group defined by the World Bank Indicators (of 2002) as having a per capita income of USD 9266 or more. Countries with per capita income of USD 9265 or less are defined as developing.

Source: World Bank.

Dummy developing countries

The variable dummy developing countries is a binary variable that takes the value 1 if a country is a developing country and 0 if the country is not.

Source: Own calculation.

Dummy transition countries

The variable dummy transition countries is a binary variable that takes the value 1 if a country is a transition country from a centrally planned economy to a market economy and 0 if the country is not. We note that only Slovenia is included in both the transition and "industrialized" (high-income) group.

Source: Own calculation.

Dummy industrialized countries

The variable dummy industrialized countries is a binary variable that takes the value 1 if a country is a high-income or transition country and 0 if the country is developing.

Source: Own calculation.

Year dummies

These are dummy variables for the periods 1994-95 and 1999-2000.

Source: Own calculation.

	Informal sector			GDP per capita			GDP per capita growth		
Country	90/91	94/95	99/00	90/91	94/95	99/00	90/91	94/95	99/00
Albania	32.6	30.6	33.4	2228	2447	3550	-0.153	0.111	0.108
Algeria	28.7	31.9	34.1	4448	4494	5328	0.017	0.024	0.037
Argentina	22.1	24.8	25.4	7837	10454	12154	0.046	0.025	-0.013
Armenia	43.8	44.3	46.3	2551	1618	2320		0.063	0.074
Australia	10.1	13.5	14.3	16854	20188	25058	0.024	0.056	0.034
Austria	6.9	8.6	9.8	19414	22699	28261	0.070	0.048	0.052
Azerbajan	50.3	57.4	60.6		1771	2374		-0.149	0.134
Bangladesh	28.4	32.4	35.6	1007	1192	1437	0.062	0.042	0.032
Belarus	44.2	46	48.1	4394	3348	4629	0.030	-0.090	0.070
Belgium	19.3	21.5	22.2	19243	21694	26523	0.056	0.044	0.053
Benin	39.6	42.3	45.2	706	792	938	0.036	0.032	0.04
Bolivia	55.4	60.4	67.1	1778	2041	2364	0.059	0.043	0.016
Bosnia and Herzegovina	28.3	31.9	34.1		1758	5111			0.077
Botswana	27.6	30.9	33.4	4560	5348	7336	0.03	0.081	0.122
Brazil	32.5	36.4	39.8	5373	6250	7143	0.000	0.052	0.033
Bulgaria	29.4	33.2	36.9	5630	5376	5683	-0.003	0.057	0.072
Burkina Faso	31.9	35.4	38.4	760	843	994	0.042	0.019	0.031
Cameroon	25.9	28.7	32.8	1656	1516	1829	-0.021	0.002	0.043
Canada	12.8	14.8	16	18644	21297	26550	0.012	0.05	0.06
Chile	13.6	16.4	19.8	5011	7030	8853	0.069	0.087	0.031
China	10.5	12	13.1	1378	2367	3758	0.088	0.138	0.088
Colombia	33.4	36.2	39.1	4983	5790	6110	0.055	0.048	0.000
Costa Rica	22	24.2	26.2	5278	6501	8727	0.018	0.036	0.074
Cote d'Ivoire	33.4	36.2	39.9	1463	1400	1601	-0.009	0.012	-0.009
Croatia	28.4	30.4	33.4	7654	6595	9131	-0.004	0.077	0.050
Czech Republic	15.9	17.2	19.1	11352	12311	14907		0.062	0.049
Denmark	10.8	17.8	18	19981	23040	27935	0.047	0.056	0.048
Dominican Republic	28.4	30.4	32.1	3442	4320	6176	-0.005	0.047	0.082
Ecuador	28.9	31.4	34.4	2908	3036	3298	0.038	0.027	0.006
Egypt	30.5	32.4	35.1	2374	2728	3499	0.049	0.038	0.059
Ethiopia	33.7	37.4	40.3	609	640	762	-0.032	0.03	0.052
Finland	13.4	18.2	18.1	18010	18992	24727	0.004	0.043	0.053
France	9	14.5	15.2	18291	20705	24970	0.047	0.044	0.048
Georgia	57.8	62.4	67.3	3349	1271	1822	-0.145	0.015	0.061
Germany	11.8	13.5	16	17881	20939	24856	0.087	0.046	0.043
Ghana	32.9	35.4	38.4	1325	1540	1852	0.049	0.032	0.041
Greece	22.6	28.6	28.7	12194	13349	16830	0.035	0.033	0.064
Guatemala	41.4	45.9	51.5	2801	3302	3910	0.042	0.043	0.034

Table A.1: Data on the informal sector, real GDP per capita and GDP growth.

	Informal sector			GDP per capita			GDP per capita growth		
Country	90/91	94/95	99/00	90/91	94/95	99/00	90/91	94/95	99/00
Honduras	40.7	44.3	49.6	2072	2318	2447	0.032	0.029	0.005
Hong Kong	11.9	13.4	16.6	17244	21288	24542	0.074	0.044	0.086
Hungary	21.4	23.9	25.1	9037	9274	12496	-0.045	0.049	0.068
India	20.6	21.8	23.1	1406	1770	2367	0.052	0.077	0.058
Indonesia	15.4	17.6	19.4	2055	2654	2960	0.167	0.081	0.039
Iran	13.7	16.8	18.9	3994	4820	5672	0.129	0.026	0.033
Ireland	11	15.4	15.9	13004	16806	29044	0.080	0.100	0.127
Israel	16.3	18.9	21.9	15220	18801	22863	0.059	0.071	0.054
Italy	22.8	26	27.1	18292	20828	24358	0.058	0.044	0.040
Jamaica	31.4	33.2	36.4	3182	3473	3610	0.09	0.034	0.024
Japan	8.8	10.6	11.2	19878	22629	25662	0.078	0.033	0.028
Jordan	15.4	17.1	19.4	3110	3666	3942	-0.003	0.032	0.022
Kazakhstan	33.7	38.4	43.2	4415	3407	4273	-0.011	-0.067	0.117
Kenya	28.4	31.2	34.3	945	965	1018	0.041	0.012	0.010
Korea	22.3	24.9	27.5	8482	11957	15514	0.121	0.099	0.095
Kyrgyz Republic	32.4	36.1	39.8	1934	1145	1509	0.008	-0.106	0.059
Latvia	32.5	36.3	39.9	7291	5148	7533	-0.066	0.041	0.089
Lebanon	27.4	30.4	34.1	2414	3738	4356	0.459	0.056	0.005
Lithuania	24.7	27.1	30.3	9226	6046	8498		-0.003	0.034
Madagascar	32.4	35.8	39.6	766	753	806	-0.015	0.005	0.034
Malawi	33.5	37	40.3	436	477	584	0.071	0.048	0.012
Malaysia	25.1	27.4	31.1	4775	6765	8508	0.100	0.088	0.087
Mali	32.7	36.9	41	563	626	772	0.038	0.040	0.035
Mexico	24.1	27.1	30.1	6388	7180	8740	0.059	0.003	0.053
Moldova	36.4	41.7	45.1	2839	1395	1299	-0.061	-0.135	0.017
Mongolia	16.2	17.1	18.4	1457	1338	1586	0.052	0.008	0.035
Morocco	29.8	32.7	36.4	2850	3030	3514	0.067	0.020	0.010
Mozambique	35.9	38.1	40.3	567	627	865	0.035	0.041	0.047
Nepal	31.7	35.2	38.4	877	1072	1287	0.067	0.055	0.047
Netherlands	11.9	13.7	13.1	19330	21991	27971	0.069	0.038	0.038
New Zealand	9.2	11.3	12.8	13438	16396	19229	0.026	0.051	0.058
Nicaragua	40.1	43.2	45.2	2638	2802	3213	0.043	-0.036	0.053
Niger	32.2	37.4	41.9	686	673	713	0.023	0.027	-0.027
Nigeria	46.7	51.5	57.9	732	780	839	0.075	-0.011	0.032
Norway	14.8	18.2	19.1	21667	26577	33531	0.064	0.058	0.037
Pakistan	28.2	31.4	36.8	1325	1616	1872	0.065	0.039	0.043
Panama	51.4	58.2	64.1	3984	4882	6100	0.112	0.026	0.034
Peru	47.1	52.3	59.9	3248	4055	4642	-0.035	0.108	0.023

Table A.1 continued.

	Informal sector			GDP per capita			GDP per capita growth		
Country	90/91	94/95	99/00	90/91	94/95	99/00	90/91	94/95	99/00
Philippines	37.2	40.1	43.4	3156	3365	3890	0.012	0.042	0.050
Poland	21.3	24.3	27.6	6041	7140	10056		0.081	0.064
Portugal	15.9	22.1	22.7	11999	13543	17738	0.075	0.044	0.055
Romania	26.2	30.6	34.4	5196	5462	5776		0.080	0.022
Russian Federation	37.5	41.3	46.1	8207	5902	6749	-0.006	-0.064	0.094
Saudi Arabia	14.2	16	18.4	10035	11415	12035	0.112	0.006	0.019
Senegal	35.1	39.1	43.2	1154	1201	1415	0.021	0.034	0.043
Serbia and Montenegro	21.9	25.8	29.1						
Singapore	9.8	11.2	13.1	12533	17403	22277	0.086	0.075	0.108
Slovak Republic	14.3	16.2	18.9	8436	8306	11052	-0.053	0.077	0.042
Slovenia	21.5	24.3	27.1		12066	16350		0.053	0.066
South Africa	22.1	24.2	28.4	8166	8394	9314	0.005	0.030	0.026
Spain	16.1	22.4	22.7	14290	16401	20794	0.068	0.045	0.053
Sri Lanka	36.2	40.1	44.6	1998	2564	3431	0.078	0.062	0.084
Sweden	15.8	19.5	19.2	18389	20273	25139	0.037	0.046	0.059
Switzerland	6.7	7.8	8.6	25065	26779	29576	0.046	0.021	0.028
Syria	12.8	16.2	19.3	2206	2840	3226	0.080	0.039	-0.015
Tanzania	45.6	51.3	58.3	439	443	509	0.047	0.008	0.041
Thailand	43.2	47.3	52.6	3919	5683	6137	0.124	0.101	0.044
Tunisia	30.9	33.6	38.4	3818	4637	6066	0.069	0.026	0.062
Turkey	26.3	29.4	32.1	4540	5207	6264	0.070	0.008	0.022
Uganda	37.2	40.1	43.1	740	918	1208	0.064	0.075	0.067
Ukraine	43.3	47.3	52.2	6754	4124	3929	-0.044	-0.156	0.063
United Arab Emirates	19.8	22.7	26.4	19606	19420	20727	0.062	0.026	0.025
United Kingdom	9.6	12.5	12.7	17979	20857	25866	0.031	0.054	0.047
United States	6.7	8.8	8.7	23398	27430	33351	0.035	0.038	0.041
Uruguay	41.3	45.3	51.1	6007	7594	8786	0.039	0.043	-0.011
Uzbekistan	27.3	30.1	34.1		1235	1478		-0.031	0.050
Venezuela	27.4	30.4	33.6	4911	5560	5584	0.071	0.005	-0.020
Vietnam	10.9	12.3	15.6	1019	1367	1941	0.105	0.079	0.061
Yemen	20.7	23.4	27.4	526	673	772		0.073	0.046
Zambia	40.7	44.3	48.9	800	723	760	0.012	-0.066	0.016
Zimbabwe	47.3	53.4	59.4	2279	2389	2600	0.075	0.053	-0.065

Table A.1 continued.

Appendix B

Panel data models

Consider the following general regression model:[1]

$$y_{it} = \boldsymbol{x}'_{it}\boldsymbol{\beta} + \boldsymbol{z}'_i\boldsymbol{\alpha} + \varepsilon_{it}$$

The $\boldsymbol{x}'_{it}$ consist of K regressors, but no constant term. The $\boldsymbol{z}'_i\boldsymbol{\alpha}$ is called the heterogeneity or individual effect and contains a constant term and a set of individual (or in our case country) specific variables that are constant over time. These variables may be observed, such as age, sex, location, etc., or they may be unobserved, such as individual skills and preferences. If all these variables are observed for all units of observation, the model may be treated as an ordinary linear model and the parameters may be estimated by least squares (OLS). If the individual effect term only consists of a constant, OLS is an efficient and consistent estimator of the slopes and constant. In this case we could use what is called pooled regression. If, however, there are unobserved variables in $\boldsymbol{z}_i$, we need to use other methods to estimate the general model. For this reason we use so-called unobserved variable models to estimate the model. There are two types of models, random and fixed effects models, and we choose from them depending on whether the unobserved individual effects are correlated with the other regressors or not.[2]

[1] For this appendix we refer to Greene (2003).

[2] The names of these models can be quite misleading; one may get the impression that the random effects model is the most plausible one since it allows for a "random" individual specific disturbance.

B.1 Fixed effects

If the individual (unobserved) effects are correlated (which is plausible in most cases), we may use the fixed effects model:

$$y_{it} = \boldsymbol{x}'_{it}\boldsymbol{\beta} + \alpha_i + \varepsilon_{it}$$

In this model all unobserved and observed time-constant effects are put into the term $\alpha_i = \boldsymbol{z}'_i\boldsymbol{\alpha}$, which is the individual specific constant term. This form of modelling is equivalent to adding a dummy variable for each observational unit. The benefit of this model is that we do not have to make the strong assumption that the individual effects are not correlated with the regressors. The downside is that we cannot include typical observable individual data that are constant over time since this will lead to perfect collinearity. Furthermore, the number of parameters to be estimated is often very large (one dummy coefficient for each individual or group), thereby reducing the degrees of freedom considerably (this is therefore one of the advantages of the random effects model). We define the matrix $\boldsymbol{D} = [\boldsymbol{d_1}\ \boldsymbol{d_2} \ldots \boldsymbol{d-n}]$ where $\boldsymbol{d_i}$ denotes the dummy variable vector for the ith unit. The fixed effects model may be then be written as

$$\boldsymbol{y} = \boldsymbol{X\beta} + \boldsymbol{D\alpha} + \boldsymbol{\varepsilon}$$

This model is also called the least squares dummy variable (LSDV) model and is based upon the same assumptions as OLS. The slopes estimator may be written as follows:

$$\boldsymbol{b} = (\boldsymbol{X}'\boldsymbol{M_D}\boldsymbol{X})^{-1}\boldsymbol{X}'\boldsymbol{M_D}\boldsymbol{y}$$

Where the data transforming matrix $\boldsymbol{M_D}$ is defined as

$$\boldsymbol{M_D} = \boldsymbol{I} - \boldsymbol{D}(\boldsymbol{D}'\boldsymbol{D})^{-1}\boldsymbol{D}'$$

B.2 Random effects

Assuming that the individual effects are uncorrelated with the regressors we may express the general model in the following way:

$$\begin{aligned} y_{it} &= \boldsymbol{x}_{it}'\boldsymbol{\beta} + E[\boldsymbol{z}_i'\boldsymbol{\alpha}] + \{\boldsymbol{z}_i'\boldsymbol{\alpha} - E[\boldsymbol{z}_i'\boldsymbol{\alpha}]\} + \varepsilon_{it} \\ &= \boldsymbol{x}_{it}'\boldsymbol{\beta} + \alpha + u_i + \varepsilon_{it} \end{aligned}$$

This is a regression model with a compound disturbance, where $u_i = \{\boldsymbol{z}_i'\boldsymbol{\alpha} - E[\boldsymbol{z}_i'\boldsymbol{\alpha}]\}$ is the individual specific random element (but constant over time) and α is the mean of the unobserved heterogeneity. Running OLS on this model will produce consistent but inefficient estimates. To estimate this model we have to apply (feasible) generalized least squares. We have the following underlying assumptions for the random effects model:

$$\begin{aligned} E[\varepsilon_{it}|\boldsymbol{X}] &= E[u_i|\boldsymbol{X}] = 0, \\ E[\varepsilon_{it}^2|\boldsymbol{X}] &= \sigma_\varepsilon^2, \\ E[u_{it}^2|\boldsymbol{X}] &= \sigma_u^2, \\ E[\varepsilon_{it}u_j|\boldsymbol{X}] &= 0 \quad \text{for all } i, t, \text{ and } j, \\ E[\varepsilon_{it}\varepsilon_{js}|\boldsymbol{X}] &= 0 \quad \text{if } t \neq s \text{ or } i \neq j, \\ E[u_i u_j|\boldsymbol{X}] &= 0 \quad \text{if } t \neq s, \end{aligned}$$

Denoting the composite disturbance as $n_{it} = \varepsilon_{it} + u_i$ and substituting it into the model, we get the "error components model" which have the assumptions

$$\begin{aligned} E[n_{it}^2|\boldsymbol{X}] &= \sigma_\varepsilon^2 + \sigma_u^2, \\ E[n_{it}n_{is}|\boldsymbol{X}] &= \sigma_u^2, \quad t \neq s \\ E[n_{it}n_{js}|\boldsymbol{X}] &= 0 \quad \text{for all } t \text{ and } s \text{ if } i \neq j, \end{aligned}$$

We now let $\boldsymbol{\Sigma} = E[\boldsymbol{n}_i\boldsymbol{n}_i'|\boldsymbol{X}]$ which on matrix form is

$$\boldsymbol{\Sigma} = \begin{pmatrix} \sigma_\varepsilon^2 + \sigma_u^2 & \sigma_u^2 & \sigma_u^2 & \dots & \sigma_u^2 \\ \sigma_u^2 & \sigma_\varepsilon^2 + \sigma_u^2 & \sigma_u^2 & & \sigma_u^2 \\ \vdots & \vdots & & \ddots & \vdots \\ \sigma_u^2 & \sigma_u^2 & \sigma_u^2 & \dots & \sigma_\varepsilon^2 + \sigma_u^2 \end{pmatrix}$$

This is the covariance matrix for the ith unit. For the whole nT data set (n individuals/units T time periods) we then get the covariance matrix

$$\boldsymbol{\Omega} = \begin{pmatrix} \boldsymbol{\Sigma} & \mathbf{0} & \dots & \mathbf{0} \\ \mathbf{0} & \boldsymbol{\Sigma} & & \mathbf{0} \\ \vdots & & \ddots & \vdots \\ \mathbf{0} & \mathbf{0} & \dots & \boldsymbol{\Sigma} \end{pmatrix}$$

The GLS estimator may then be applied to obtain the slopes parameters:

$$\hat{\boldsymbol{\beta}} = (\boldsymbol{X}'\boldsymbol{\Omega}^{-1}\boldsymbol{X})^{-1}\boldsymbol{X}'\boldsymbol{\Omega}^{-1}\boldsymbol{y}$$

B.3 Which model should we choose?

Hausman (1978) has developed a test that examines whether there are systematic differences in the estimated coefficients of the fixed and random effect models. If there are systematic differences in the estimates, we can conclude that the random effects model is inconsistent since there has to be correlation between the individual effects and the regressors to ensure such systematic differences. If there is no systematic difference in the estimates, we cannot reject the hypothesis that there is no correlation between the individual unobserved effects and the regressors. The test statistic is based upon the covariance matrix of the difference vector $[\boldsymbol{b} - \hat{\boldsymbol{\beta}}]$. Hausman (1978) finds that "the covariance of an efficient estimator with its difference from an inefficient estimator is zero", thus we may write the covariance matrix as follows:

$$Var[\boldsymbol{b} - \hat{\boldsymbol{\beta}}] = Var[\boldsymbol{b}] - Var[\hat{\boldsymbol{\beta}}] = \boldsymbol{\Psi}$$

	$(\boldsymbol{b})$	$(\hat{\boldsymbol{\beta}})$	$(\boldsymbol{b}\text{-}\hat{\boldsymbol{\beta}})$	$\sqrt{diag(\hat{\boldsymbol{\Psi}}^{-1})}$
infind	.0008598	-.0007473	.0016071	.0027925
infdev	-.0042164	-.0005299	-.0036865	.0020455
lalngdp	-.1187871	.001282	-.1200691	.0226069
open	.0003305	.0001292	.0002014	.0002176
inflrest	-.0000111	-8.04e-06	-3.09e-06	4.11e-06
infltran	-.0000478	-.0000263	-.0000215	7.01e-06
gov	.0007062	-.000281	.0009872	.0008578
pop	8.93e-11	3.71e-11	5.22e-11	2.80e-10
caac	.0679291	.1064775	-.0385484	.0093775
yr95	.0086721	-.0118309	.020503	.0085327
yr00	.0523723	.0126102	.0397621	.0163847

$\boldsymbol{b}$ = consistent under Ho and Ha; obtained from fixed effects
$\hat{\boldsymbol{\beta}}$ = inconsistent under Ha, efficient under Ho; obtained from random effects
Test: Ho: difference in coefficients not systematic

$$\chi^2(9) = (\boldsymbol{b} - \hat{\boldsymbol{\beta}})' \hat{\boldsymbol{\Psi}}^{-1} (\boldsymbol{b} - \hat{\boldsymbol{\beta}})$$
$$= 97.13$$
$$Prob > \chi^2 = 0.0000$$

Table B.1: Hausman test of specification.

The chi-squared test is based on the Wald criterion,

$$W = \chi^2[K-1] = [\boldsymbol{b} - \hat{\boldsymbol{\beta}}]' \hat{\boldsymbol{\Psi}}^{-1} [\boldsymbol{b} - \hat{\boldsymbol{\beta}}]$$

and under the null hypothesis the test statistic has a chi-squared distribution with K-1 degrees of freedom. Consider the test of specification reported in table B.1 performed on our benchmark specification.[3] With 10 degrees of freedom we have a critical χ^2-value of 18.31 at conventional levels of significance, which is far less than the reported statistic. Thus we may reject the null hypothesis that the models do not differ systematically, and we choose the fixed effects model.

[3] I.e. this is a test of which of the regressions (1) and (3) we should prefer.

Appendix C

Extended econometric analysis

C.1 Schneider's (2005) approach

This approach is the same as we take in chapter 7, except that we now include the lagged growth variable instead of the lagged GDP to use the exact same specification as Schneider (2005). A few points are worth noting here:

- According to the Hausman test we find that the fixed effects model is the most appropriate one. This contradicts the result of the Hausman test performed by Schneider (2005).
- In the fixed effects regressions the estimated coefficients for the informal sector are positive in all regressions (9), (10), (13) and (14) except for the coefficients in developing countries when we take account of the institutional variables.
- Including the institutional variables in the fixed effects model renders the impact of informality in high-income economies smaller and insignificant. The effect of informality in developing countries is insignificant in all the fixed effects regressions regardless.
- In the random effects regressions the effect of informality is negative for GDP growth in all specifications (i.e. in (11), (12), (15) and (16)). The significance of these coefficients varies.

- Contrary to the results found in our original analysis, we find that the effect of improving the institutional quality is significant in most cases. The signs of these variables are mostly of the unexpected kind, and the overall effect of the democracy variables are negative in three out of four cases. The rule of law variable is mostly significant, and is negative in all cases.

- Contrary to our original analysis, we find here that most of the constants are negative. This is probably due to the large effect that the lagged growth has on the results.

This brings us to the rather surprising conclusion that the results presented here are even more different from the results reported in Schneider (2005) than our original results. This applies to the results of both the fixed and random effects regressions.

C.2 Barro and Sala-i-Martin's (2004) approach

At the outset, the empirical strategy involved taking two paths. The first approach was to replicate and extend the specifications made by Schneider (2005), the other was to follow the recommended strategy presented by Barro and Sala-i-Martin (2004). Knowing that this approach is the basis of Schneider's (2005) econometric growth model, we expected to find quite similar results, but there are some significant differences. Schneider (2005) has excluded some seemingly important variables, and we took on the same approach as Barro and Sala-i-Martin (2004) to find out if there were any differences compared to the analysis of Schneider (2005). One issue was why Schneider (2005) has not included the so-called institutional variables (such as democracy and rule of law).

Barro and Sala-i-Martin's (2004) "benchmark" specification:

Growth in per capita GDP =
log of per capita GDP + male gross secondary school attainment + reciprocal of life expectancy at birth + log of fertility rate + government consumption ratio + rule of law + democracy + democracy squared + openness ratio + change in terms of trade + investment ratio + inflation rate + year dummies

	Fixed effects models		Random effects models	
	(9)	(10)	(11)	(12)
Informal sector in industrialized countries	0.00646	0.00181	-0.00033	-0.00012
	(3.79)**	(0.93)	(1.82)*	(0.49)
Informal sector in developing countries	0.00074	-0.00061	-0.00023	-0.00032
	(0.56)	(0.46)	(1.70)*	(1.65)*
Lagged GDP per capita growth rate	0.74108	0.68882	0.71078	0.69104
	(15.72)**	(12.60)**	(17.57)**	(15.39)**
Openness	0.00056	0.00049	0.00012	0.00016
	(3.71)**	(3.24)**	(2.84)**	(2.66)**
Inflation rate other countries	6.77e-06	3.27e-06	1.22e-05	1.06e-05
	(1.34)	(0.67)	(2.76)**	(2.48)**
Inflation rate transition economies	2.82e-05	-0.00014	2.44e-05	-0.00010
	(3.32)**	(0.92)	(3.26)**	(1.35)
Government consumption	0.00134	0.00191	0.00012	0.00043
	(2.08)**	(2.97)**	(0.37)	(1.19)
Total population	-6.93e-07	-1.03e-06	1.31e-07	1.54e-07
	(0.39)	(0.60)	(1.18)	(1.20)
Capital accumulation	0.08007	0.07817	0.07413	0.07147
	(7.95)**	(7.49)**	(8.09)**	(7.53)**
Year dummy 1995	-0.00733	0.00533	0.00563	0.01314
	(1.24)	(0.83)	(1.42)	(3.11)**
Year dummy 2000	0.00058	0.01351	0.02274	0.02403
	(0.06)	(1.45)	(5.69)**	(5.66)**
Rule of law		-0.01755		-0.02666
		(1.52)		(3.14)**
Democracy		-0.08148		-0.04556
		(2.28)**		(1.82)*
Democracy squared		0.08775		0.04242
		(2.65)**		(1.82)*
Constant	-0.12451	-0.03805	-0.00398	0.01035
	(3.03)**	(0.90)	(0.48)	(0.93)
Observations	299	275	299	275
Countries	106	102	106	102
R^2 (within)	0.71	0.68	0.64	0.64
Wald χ^2	40.00	24.28	521.48	416.39
F-Test	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Hausman χ^2			52.30	34.81
			(0.0000)	(0.0005)

Random effects GLS and fixed effects estimation. Dependent variable is real GDP per capita growth rate. Absolute value of t statistics in parentheses (z statistics for the random effects regressions). * significant at 10%; ** significant at 5%. For the random effects specifications Wald χ^2 is reported, while F-tests of specification are reported for the fixed effects regressions.

Table C.1: Schneider approach.

	Fixed effects models		Random effects models	
	(13)	(14)	(15)	(16)
Informal sector in transition countries	0.00791	0.00127	-0.00042	-0.00021
	(3.19)**	(0.30)	(1.90)*	(0.76)
Informal sector in developing countries	0.00011	-0.00095	-0.00028	-0.00040
	(0.06)	(0.48)	(1.46)	(1.70)*
Lagged GDP per capita growth rate	0.75057	0.7371	0.73845	0.72476
	(12.85)**	(10.62)**	(15.41)**	(13.27)**
Openness	0.00056	0.00048	0.00015	0.00019
	(3.05)**	(2.47)**	(2.23)**	(2.54)**
Inflation rate other countries	7.20e-06	4.26e-06	1.27e-05	1.16e-05
	(1.28)	(0.75)	(2.56)**	(2.36)**
Inflation rate transition economies	3.06e-05	-0.0001	2.77e-05	-8.53e-05
	(3.23)**	(0.40)	(3.24)**	(0.95)
Government consumption	0.00135	0.00200	0.00017	0.00050
	(1.87)*	(2.64)**	(0.40)	(1.11)
Total population	-9.50e-07	-1.06e-06	1.21e-07	1.31e-07
	(0.46)	(0.53)	(0.96)	(0.94)
Capital accumulation	0.08046	0.07902	0.07255	0.07109
	(6.88)**	(6.25)**	(6.77)**	(6.29)**
Year dummy 1995	-0.00345	0.00931	0.0040	0.01405
	(0.42)	(1.04)	(0.78)	(2.46)**
Year dummy 2000	0.00614	0.02015	0.0217	0.02611
	(0.43)	(1.39)	(4.17)**	(4.61)**
Rule of law		-0.02716		-0.03255
		(1.79)*		(2.95)**
Democracy		-0.08803		-0.0461
		(2.10)**		(1.62)
Democracy squared		-0.09250		0.04087
		(2.35)**		(1.51)
Constant	-0.10896	-0.0099	-0.00417	0.01149
	(1.66)	(0.14)	(0.40)	(0.89)
Observations	222	202	222	202
Countries	80	77	80	77
R^2 (within)	0.73	0.69	0.66	0.66
Wald χ^2	32.86	18.02	380.79	295.6
F-Test	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Hausman χ^2			47.54	33.99
			(0.0000)	(0.0007)

Random effects GLS and fixed effects estimation. Dependent variable is real GDP per capita growth rate. Absolute value of t statistics in parentheses (z statistics for the random effects regressions). * significant at 10%; ** significant at 5%. For the random effects specifications Wald χ^2 is reported, while F-tests of specification are reported for the fixed effects regressions.

Table C.2: Schneider approach. Without the high-income group.

A few more extensions were made to the econometric model proposed by Barro and Sala-i-Martin (2004):

- We run regressions with random and fixed effects.
- The informal sector variable is included.
- We make the same distinction between the informal sector in industrialized (high-income) countries and developing (non-high-income) countries, and later between transition (former centrally planned economies) and developing (non-high-income and non-transition) countries as in Schneider (2005).

There are some important differences in the data and specification here compared to the empirical treatment in Barro and Sala-i-Martin (2004):

- The government consumption ratio (that is measured by the share of general government final consumption expenditure to GDP) does not exclude the expenditure on defence and education as in Barro and Sala-i-Martin (2004), since this type of expenditure data is not available for the relevant time periods or countries of observation.
- Male upper-level schooling is not readily used in our regression. This is due to the lack of data on school attainment in developing countries. We have data on male gross secondary school attainment for the years 1991 and 2000. Leaving this variable out of the specification might improve the fit of the model.
- In the Barro and Sala-i-Martin (2004) specification the reciprocal of life expectancy at age one is used. Data on this variable is not available to us, thus the life expectancy at birth is used.
- Change in terms of trade is defined in Barro and Sala-i-Martin (2004) as the growth rate of the terms of trade (export prices relative to import prices) multiplied by the ratio of exports plus imports to GDP (i.e. the openness ratio). Since price data is not available we use the terms of trade adjustment variable from the WDI databank of the World Bank. This variable is defined as the capacity to import less exports of goods and services in constant prices (measured in constant local currency).

- The investment ratio is also from Penn World Tables and is therefore expressed in real terms. Our measure of investment is gross capital formation (World Bank national accounts data) which is based on current US$.

- One big difference is of course that Barro and Sala-i-Martin (2004) looks at different time periods, i.e. 1965-75, 75-85 and 85-95. This may not constitute much problems *per se*, but the time periods are longer, making it less likely that the estimates are distorted by short or medium term cyclical fluctuations.

- Barro and Sala-i-Martin (2004) does not use random or fixed effects estimation, but applies the method of three stage least squares (3SLS), which is a instrumental variable method. This point is especially important since the specification is not made to fit the fixed or random effects models and may thus not be appropriate in our approach.

The result of this approach is reported in table C.3. We comment on the most important findings:

- The coefficient on the informal sector is negative in all groups and regressions. The coefficient on developing country informality is significant in all regressions except in the last one. In the fixed effects regressions only the informal sector coefficients are significant at the 10% level of confidence. In the random effects regressions the effect of the informal sector in developing countries is insignificant when we remove the high-income countries from the data set.

- As we have previously seen, the level of the effect of informality is larger in the fixed effects regressions. Removing the high-income countries produces the highest levels, where the informal sector in transition economies seems to have almost a one-to-one (negative) relationship.

- The Hausman test determines that the fixed effects model is the appropriate regression model.

- Compared to the results reported in Barro and Sala-i-Martin (2004), several variables does not have the expected sign. These variables are government consumption, the institutional variables, terms of trade and the investment ratio. The

signs on the latter two variables are especially surprising, considering that they are normally thought to be important determinants of growth.

- The democracy variables are insignificant and their overall effect on growth is negative.

	Fixed effects models		Random effects models	
	(17)	(18)	(19)	(20)
Informal sector in industrialized countries	-0.00306		-0.00090	
	(1.01)		(2.14)**	
Informal sector in transition countries		-0.00929		-0.00094
		(1.66)		(1.93)*
Informal sector in developing countries	-0.00429	-0.00771	-0.00074	-0.00040
	(1.95)*	(2.39)**	(2.05)**	(0.97)
Lagged log of GDP per capita	-0.15521	-0.18963	-0.02078	-0.02897
	(5.87)**	(5.48)**	(3.45)**	(3.71)**
Reciprocal of life expectancy	-0.33768	-0.66009	-2.96859	-3.78080
	(0.10)	(0.17)	(1.72)*	(1.92)*
Log of fertility rate	0.04152	0.06925	-0.04016	-0.05277
	(1.06)	(1.16)	(3.05)**	(3.08)**
Government consumption	0.00230	0.00278	0.00101	0.00136
	(2.04)**	(2.07)**	(1.57)	(1.71)*
Rule of law	-0.00093	-0.00142	-0.03954	-0.04071
	(0.05)	(0.06)	(2.70)**	(2.22)**
Democracy	-0.01946	-0.04160	-0.03752	-0.03220
	(0.31)	(0.57)	(0.88)	(0.66)
Squared democracy	0.00719	0.02836	0.03008	0.01783
	(0.12)	(0.42)	(0.74)	(0.38)
Openness	0.00084	0.00069	0.00027	0.00025
	(3.37)**	(2.20)**	(2.96)**	(2.12)**
Change in terms of trade	-2.81e-16	-2.14e-16	-4.15e-16	-9.65e-16
	(0.40)	(0.24)	(0.87)	(1.65)*
Investment ratio	-0.00190	-0.00187	-0.00024	-0.00021
	(0.58)	(0.50)	(0.47)	(0.39)
Inflation	-1.53e-05	-1.60e-05	-1.02e-05	-1.03e-05
	(2.00)**	(1.83)*	(1.52)	(1.34)
Year dummy 1995	0.02459	0.04368	0.00008	-0.00139
	(2.06)**	(2.42)**	(0.01)	(0.14)
Year dummy 2000	0.06222	0.10822	-0.00300	-0.00485
	(3.03)**	(3.22)**	(0.42)	(0.49)
Constant	1.32304	1.61775	0.33139	0.41332
	(5.34)**	(4.89)**	(4.94)**	(4.90)**
Observations	257	188	257	188
Countries	98	73	98	73
R^2 (within)	0.37	0.41	0.19	0.20
Wald χ^2	5.74	4.66	54.60	45.66
F-Test	(0.0000)	(0.0153)	(0.0004)	(0.0001)
Hausman χ^2			66.70	31.84
			(0.0000)	(0.0008)

Random effects GLS and fixed effects regression. Dependent variable is real GDP per capita growth rate. Absolute value of t statistics in parentheses (z statistics for the random effects regressions). * significant at 10%; ** significant at 5%. For the random effects specifications Wald χ^2 is reported, while F-tests of specification are reported for the fixed effects regressions.

Table C.3: Barro and Sala-i-Martin approach.

Appendix D

GDP controversy

D.1 Problems related to the measurement of GDP

The measurement of informality is naturally controversial since it by definition is unobservable. This makes any estimate of its magnitude fraught with uncertainty. As should be obvious from our previous discussions, the measurement of GDP is central to the measurement of informality. What is not so obvious is that the measurement of GDP is also a very uncertain estimate. This is at the outset due to the challenge of measuring the value added by all economic activities, and the statisticians that estimate the GDP must often make simplifying assumptions to be able to compute the GDP. But there are also other problems with this measurement that are potentially devastating for the gathering of GDP data worldwide: Tanzi (1999) discusses the political implications of the GDP data and how countries and politicians have strong incentives to change the reported national GDP data. Producing strong GDP data may for instance give the false impression that the government has successfully promoted growth with their economic policies and may be used by the incumbent leadership to consolidate their position in people's opinion. At the other hand, governments may have the incentive to reports a low GDP to qualify themselves to receive foreign aid. The overall effect of these incentives are unknown and may go either way since governments and politicians may have incentives to both understate or overstate the size of GDP. Considering that the methods that estimate informality rely heavily on the precision of the GDP data

makes the methods even more uncertain.

Another important issue to address is the fact that in response to the discrepancies in GDP data, statisticians try to correct their data by estimating the volume of value added from the informal sector, thereby possibly making the GDP measurement even more uncertain. This is important for e.g. the MIMIC model that often uses GDP as an indicator for the informal sector, meaning that one may detect changes in the informal sector by considering its impact on (official) GDP. This may be a serious problem since the GDP data no longer becomes a measurement of the official/formal sector when statisticians correct their GDP data (i.e. they should also report their uncorrected data).

An obvious problem with many estimates of informality (and many other macroeconomic data) is that it is often measured relative to GDP. The uncertainty of the GDP measurement will thus be transferred to the informality measurement. Furthermore, this unit of measurement may vary with informality, depending on whether the official GDP includes the whole informal sector value added or not.

D.2 GDP growth data

As noted in our empirical analysis we believe that we are using the same source of GDP data as Schneider (2005), i.e. the World Bank's world development index (WDI). However, it seems that we have quite different data: Comparing our data with the GDP growth data (from 2000) reported in Schneider (2005), we find that there are quite large discrepancies in the numbers. In some cases the differences are alarming (consider e.g. the reported numbers for Botswana). In table D.1 we report the difference between the GDP growth data in Schneider (2005) and the data found in WDI for the years 1999-2000.[1] The average absolute difference is 1.26%. To check if Schneider (2005) may refer to some other kind of data, we also compared the data with GDP *per capita* growth data for 2000 (1.98% difference), GDP growth averaged over 1999-2000 (1.92%) and GDP *per capita* growth averaged over 1999-2000 (2.67% average absolute difference).

[1] We compute the growth rate as shown in chapter 7.

Country	Schneider's data	World Bank data	Absolute difference
Albania	9.15	8.96	0.19
Algeria	5.05	4.92	0.13
Argentina	1.77	1.39	0.38
Armenia	8.16	8.51	0.35
Australia	4.21	4.14	0.07
Austria	5.34	5.40	0.06
Azerbaijan	20.37	19.1	1.27
Bangladesh	8.58	8.04	0.54
Belarus	8.30	8.66	0.36
Belgium	6.13	6.33	0.20
Benin	8.42	7.92	0.50
Bolivia	5.04	5.07	0.03
Bosnia and Herzegovina	0.00	8.65	8.65
Botswana	-2.06	11.66	13.72
Brazil	7.68	6.06	1.62
Bulgaria	9.30	8.97	0.33
Burkina Faso	4.66	3.82	0.84
Cameroon	8.45	6.27	2.18
Canada	6.17	6.67	0.50
Chile	8.51	7.55	0.96
China	9.92	10.27	0.35
Colombia	1.04	6.25	5.21
Costa Rica	-0.37	-0.13	0.24
Cote d'Ivoire	0.77	-0.94	1.71
Croatia	5.96	5.42	0.54
Czech Republic	5.47	6.35	0.88
Denmark	6.34	6.43	0.09
Dominican Republic	9.86	10.06	0.20
Ecuador	3.98	6.22	2.24
Egypt	7.73	7.91	0.18
Ethiopia	8.01	7.64	0.37
Finland	7.91	7.15	0.76
France	5.32	6.51	1.19
Georgia	8.20	5.44	2.76
Germany	5.24	5.31	0.07
Ghana	7.03	6.88	0.15
Greece	7.18	7.24	0.06
Guatemala	6.03	5.93	0.10

Table D.1: Discrepancies in GDP growth data for 2000.

Country	Schneider's data	World Bank data	Absolute difference
Honduras	6.52	7.65	1.13
Hong Kong	14.26	14.04	0.22
Hungary	7.63	7.69	0.06
India	6.35	6.57	0.22
Indonesia	6.96	6.07	0.89
Iran	7.14	7.15	0.01
Ireland	15.67	12.3	3.37
Israel	10.64	12.03	1.39
Italy	5.25	5.45	0.20
Jamaica	4.1	2.91	1.19
Japan	4.78	4.62	0.16
Jordan	4.57	2.69	1.88
Kazakhstan	16.14	15.95	0.19
Kenya	1.82	2.44	0.62
Korea	10.43	9.87	0.56
Kyrgyz Republic	7.70	7.97	0.27
Latvia	7.87	9.63	1.76
Lebanon	2.03	2.60	0.57
Lithuania	5.52	5.43	0.09
Madagascar	8.06	7.82	0.24
Malawi	4.25	3.49	0.76
Malaysia	14.61	12.87	1.74
Mali	6.86	4.98	1.88
Mexico	9.09	8.83	0.26
Moldova	1.56	4.81	3.25
Mozambique	4.89	5.09	0.20
Mongolia	3.88	3.94	0.06
Morocco	2.60	2.97	0.37
Nepal	8.62	8.29	0.33
Netherlands	5.94	5.48	0.46
New Zealand	4.86	4.71	0.15
Nicaragua	7.25	6.24	1.01
Niger	2.45	0.69	1.76
Nigeria	6.89	13.69	6.80
Norway	4.45	4.84	0.39
Pakistan	7.05	8.46	1.41
Panama	2.27	4.12	1.85
Peru	5.31	5.21	0.10

Table D.1 continued.

Country	Schneider's data	World Bank data	Absolute difference
Philippines	6.28	9.43	3.15
Poland	6.32	6.75	0.43
Portugal	6.00	6.55	0.55
Romania	3.74	3.87	0.13
Russia	8.81	10.85	2.04
Saudi Arabia	8.86	8.83	0.03
Senegal	8.08	5.32	2.76
Singapore	13.76	16.00	2.24
Slovak Republic	4.90	4.54	0.36
Slovenia	7.24	6.65	0.59
South Africa	5.58	6.4	0.82
Spain	6.3	6.8	0.50
Sri Lanka	8.73	13.9	5.17
Sweden	6.17	6.39	0.22
Switzerland	5.37	4.68	0.69
Syria	7.52	3.67	3.85
Tanzania	7.00	7.59	0.59
Thailand	5.18	5.76	0.58
Tunisia	7.42	7.54	0.12
Turkey	10.05	10.02	0.03
Uganda	5.90	10.36	4.46
Ukraine	8.48	8.50	0.02
United Arab Emirates	0.00	5.80	5.80
United Kingdom	5.97	5.46	0.51
United States	7.44	4.97	2.47
Uruguay	1.24	0.64	0.60
Uzbekistan	7.86	6.78	1.08
Venezuela	5.06	5.63	0.57
Vietnam	7.93	9.22	1.29
Yemen	12.64	7.40	5.24
Zambia	4.86	5.67	0.81
Zimbabwe	-5.58	-6.58	1.00

Table D.1 continued.

Bibliography

Adam, Marcus C. & Victor Ginsburgh (1985), 'The effects of irregular markets on macroeconomic policy', *European Economic Review* **29**, pp.15–33.

Allingham, Michael G. & Agnar Sandmo (1972), 'Income tax evasion: A theoretical analysis', *Journal of Public Economics* **1**, pp. 323–338.

Andresen, Kari Due, Tone Ognedal & Steinar Strøm (2005), The shadow economy in norway 1980-2003: Some empirical evidences from voluntary sample surveys, *in* C.Bajada & F.Schneider, eds, 'Size, Causes and Consequences of the Underground Economy.', Ashgate Publishing Limited.

Asea, Patric K. (1996), 'The informal sector: Baby or bath water? - a comment.', *Carnegie-Rochester Conference Series on Public Policy* **45**, pp. 163–171.

Barro, Robert J. & Xavier Sala i Martin (1995), *Economic Growth*, McGraw-Hill, New York.

Barro, Robert J. & Xavier Sala i Martin (2004), *Economic Growth*, MIT.

Boeke, Julius H. (1953), *Economics and economic policy of dual societies*, New York: Institute of Pacific Relations.

Breton, Theodore R. (2001), Missing data and omitted variables: The continuing search for a complete solow growth model. Working Paper, George Mason University. Retrieved 6th January 2007.
URL: *http://economics.gmu.edu/working/WPE_02/02_25.pdf*

Breusch, Trevor (2005b), Estimating the underground economy using mimic models. Working paper, Canberra, Australia. Retrieved September 7th, 2006.
URL: *http://129.3.20.41/eps/em/papers/0507/0507003.pdf*

Cagan, Philip (1958), 'The demand for currency relative to the total money supply', *Journal of Political Economy* **66**, pp. 303–328.

Cowell, Frank A. & James P. F. Gordon (1988), 'Unwillingness to pay: Tax evasion and public goods provision', *Journal of Public Economics* **36**, pp.305–321.

de Soto, Hernando (1989), *The Other Path*, I.B. Tauris & Co Ltd.

Dell'Anno, Roberto & Friedrich Schneider (2006), Estimating the underground economy by using mimic models: A response to breuch's critique. Working Paper No. 0607. Retrieved September 7th, 2006.
URL: *http://www.econ.jku.at/papers/2006/wp0607.pdf*

Djankov, Simeon, Ira Lieberman, Joyita Mukherjee & Tatiana Nenova (2003), Going informal: Benefits and costs, *in* B.Belev, ed., 'The Informal Economy in the EU Accession Countries: Size, Scope, Trends and challenges to the process of EU Enlargement', Center for the Study of Democracy.

Enste, Dominic H. (2003), Shadow economy and institutional change in transition countries, *in* B.Belev, ed., 'The Informal Economy in the EU Accession Countries: Size, Scope, Trends and challenges to the process of EU Enlargement', Center for the Study of Democracy.

Feige, Edgar L. (1996), Overseas holdings in the U.S. currency and the underground economy, *in* S.Pozo, ed., 'Exploring the Underground Economy', W.E. Upjohn Institute of Employment Research.

Feige, Edgard L. (1981), 'The UK's unobserved economy: A preliminary asessment', *Journal of Economic Affairs* **1**, pp. 205–212.

Feige, Edgard L., ed. (1989), *The Underground Economies: Tax evasion and information distortion*, Cambridge University Press.

Feinstein, Jonathan S. (1999), 'Approaches for estimating noncompliance: Examples from federal taxation in the united states', *The Economic Journal* **109**(495), pp. F360–F361.

Fields, Gary S. (1975), 'Rural-urban migration, urban unemployment and underemployment, and job-search activity in ldcs.', *Journal of Developmental Economics* **2**, pp. 165–187.

Frey, Bruno S. & Werner W. Pommerehne (1984), 'The hidden economy: State and prospects for measurement', *Review of Income and Health* **30**(1), pp. 1–23.

Gërxhani, Klarita (2004), 'The informal sector in developed and less developed countries: A literature survey', *Public Choice* **120**, pp. 267–300.

Greene, William H. (2003), *Econometric Analysis*, Prentice Hall.

Harris, John R. & Michael P. Todaro (1970), 'Migration, unemployment and development: A two-sector analysis.', *American Economic Review* **60**(1), pp. 126–142.

Hart, Keith (1973), 'Informal income opportunities and urban employment in ghana.', *Journal of Modern Africa Studies* **11**, pp. 61–89.

Hausman, Jerry A. (1978), 'Specification tests in econometrics', *Econometrica* **46**, pp. 1251–1271.

ILO (1972), 'Employment, income and equality: A strategy for increasing productivity in kenya', International Labor Office, Geneva: ILO.

ILO (2002), 'Womoen and men in the informal economy: A statistical picture', International Labor Office, Geneva. Retrieved September 7th, 2006.
URL: *http://www.ilo.org/public/english/employment/gems/download/women.pdf*

Isacsen, Arne Jon & Steinar Strøm (1989), The hidden economy in norway with special emphasis on the hidden labour market., *in* E. L.Feige, ed., 'The Underground Economies', Cambridge University Press.

Kaufmann, Daniel & Aleksander Kaliberda (1996), Integrating the unofficial economy into the dynamics of post-socialist economies: A framework of analysis and evidence. World Bank Working Paper. Retrieved October 2nd.
URL: *http://www.worldbank.org/wbi/governance/pdf/wps1691.pdf*

Klovland, Jan Tore (1984), 'Tax evasion and the demand for currency in norway and sweden. Is there a hidden relationship?', *The Scandinavian Journal of Economics* **86**(4), pp.423–439.

Lackó, Mariá (1998), The hidden economies of visegrad countries in international comparison: A household electricity approach, *in* 'Hungary: Towards a Market Economy', Cambridge, MA: Cambridge U. Press, pp. pp. 128–152. Working Paper Laxenburg, Austria: IIASA.

Levenson, Alec R. & William F. Maloney (1998), The informal sector, firm dynamics and institutional participation. World Bank. Retrieved 28th December 2006.
URL: *http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1998/11/17/000178830_98111703524416/additional/120520322_20041117180056.pdf*

Lewis, W. A. (1954), 'Economic development with unlimited supplies of labour.', *Manchester School* **22**, pp. 139–191.

Loaysa, Norman V. (1996), 'The economics of the informal sector: A simple model and some empirical evidence from latin america', *Carnegie-Rochester Conference Series on Public Policy* **45**, pp. 129–162.

Lubell, Harold (1991), 'The informal economy in the 1980s and 1990s', Paris: OECD.

Mordignon, Massimo (1992), 'A fairness approach to income tax evasion', *Journal of Public Economics* **52**, pp. 345–362.

O'Higgins, Michael (1989), Assessing the underground economy in the united kingdom, *in* E. L.Feige, ed., 'The Underground Economies', Cambridge University Press, chapter 7, pp. pp. 175–195.

Palmade, Vincent & Andrea Anayiotos (2005), Rising informality: Reversing the tide. World Bank Note No. 298, Aug. 2005. Retrieved September 6th, 2006.
URL: *http://rru.worldbank.org/Documents/PublicPolicyJournal/298Palmade_Anayiotos.pdf*

Renooy, Piet H. (1990), 'The informal economy: Meaning, measurement and social significance.', Amsterdam: Netherlands Geographical Studies.

Schneider, Friedrich (2005), 'Shadow economies all over the world: What do we really know?', *European Journal of Political Economy* **21**, pp. 598–642.

Schneider, Friedrich & Dominic Enste (2000), 'Shadow economies: Size, causes and consequences', *Journal of Economic Literature* **38**(1), pp. 77–114.

Schneider, Friedrich & Dominic H. Enste (2002), *The Shadow Economy*, Cambridge University Press.

Smith, Stephen (1986), *Britain's Shadow Economy*, Oxford : Clarendon Press.

Tanzi, Vito (1980), 'The underground economy in the united states: Estimates and implications', *Banca Nazionale del Lavoro* **135**(pp. 427-453).

Tanzi, Vito (1983), The underground economy in the united states, 1930-1980. IMF Working Paper.

Tanzi, Vito (1999), 'Uses and abuses of estimates of the underground economy', *The Economic Journal* **109**(495), pp. F338–F347.

Thomas, James (1992), *Informal Economic Activity*, Harvester Wheatsheaf.

Thomas, James (1999), 'Quantifying the black economy: 'measurement without theory' yet again?', *The Economic Journal* **109**(495), pp. F381–F389.

Wintrobe, Ronald (2001), Tax evasion and trust. Working Paper. Retrieved 22nd December 2006.
URL: *http://ssc.uwo.ca/economics/econref/WorkingPapers/researchreports/wp2001/wp2001_11.pdf*